Instruction book for
Stationary Compressors

SF1 - SF2 - SF4 - SF6T - SF8T

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This instruction book meets the requirements for instructions specified by the machinery directive 89/392/EEC and is valid for CE as well as non-CE labelled machines

Atlas Copco **Industrial Air Division - B-2610 Wilrijk - Belgium**

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This instruction book describes how to handle the machines to ensure safe operation, optimum efficiency and long service life.

Read this book before putting the machine into operation to ensure correct handling, operation and proper maintenance from the beginning. The maintenance schedule comprises measures for keeping the machine in good condition.

Keep the book available for the operator and make sure that the machine is operated and that maintenance is carried out according to the instructions. Record all operating data, maintenance performed, etc. in an operator's logbook available from Atlas Copco. Follow all relevant safety precautions, including those mentioned on the cover of this book.

Repairs must be carried out by trained personnel from Atlas Copco who can be contacted for any further information.

In all correspondence mention the type and the serial number, shown on the data plate.

For all data not mentioned in the text, see sections "Preventive maintenance schedule" and "Principal data".

The company reserves the right to make changes without prior notice.

Contents

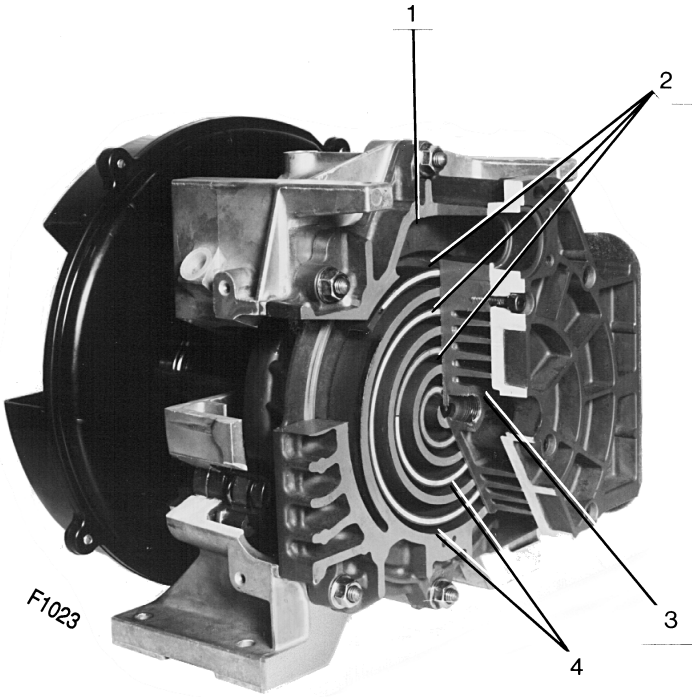
1 LEADING PARTICULARS

1.1 General description

SF are stationary, single-stage, oil-free compressors. They are air-cooled. The power from the drive motor is transmitted to the compressor element through one or two belts.

1.1.1 Compressor element (Fig. 1)

The compressor element consists of a fixed scroll-shaped housing and a scroll-shaped rotor. Air enters the compressor element through inlet opening (1). Once the air is drawn in, the orbiting scroll (4) seals the inlet opening and forces the air into a continuously decreasing space. As scroll (4) keeps orbiting, this process of compression is constantly repeated, resulting in discharging of oil-free compressed air through outlet opening (3).



1. Air inlet
2. Fixed scroll
3. Compressed air outlet
4. Orbiting scroll

Fig. 1. Compressor element

1.1.2 Compressor variants

SF compressors have following main components (Figs. 2 and 3):
- compressor element (E)
- air filter (AF)
- drive motor (M1)
- check valve (CV)
- temperature shut-down switch (TSHH11)
- air cooler (Ca) and cooling fan (FN1)

Check valve (CV) prevents blow-back of compressed air when the compressor is stopped. Temperature shut-down switch (TSHH11) and safety valve (SV) protect the compressor against overheating and overpressure respectively.

SF Standard (Fig. 2a)
Most of the main components are housed in a hinged bodywork top which serves as silencing hood (4). The hood is mounted on a 120 l air receiver (AR) (a 250 l receiver is available as option). A pressure switch (S2), safety valve (SV), air outlet valve (AV), drain valve (Dm) and pressure gauge (Gp) are fitted to the receiver. A circuit breaker (S1) is also provided.

SF Skid (Fig. 2b)
Most of the main components are housed in a hinged bodywork top which serves as silencing hood (4). The hood is mounted on a frame (5) allowing installation of the compressor at the required spot.

SF Twin (Fig. 2c)
Two compressor modules are mounted on a 250 l or 475 l air receiver (AR). Each module is provided with the main components as described above and has its own pressure switch (S2) and circuit breaker (S1).

SF Pack (Fig. 3a)
The compressor is enclosed in a sound-insulated bodywork. A control panel, pressure switch (PSR19) and safety valve are provided. An electric cubicle is installed behind the front door.

SF Full-feature (Fig. 3b)
SF Full-feature are SF Pack compressors additionally provided with an air dryer of the refrigerant type. The dryer removes moisture from the compressed air. See section 1.5.

An optional electronically controlled condensate drain valve to flush the receiver at pre-set intervals may be installed.

1.2 Air flow (Figs. 2 and 3)

Air is drawn through air filter (AF) into compressor element (E) and is compressed. Compressed air is discharged through air cooler (Ca) and check valve (CV).

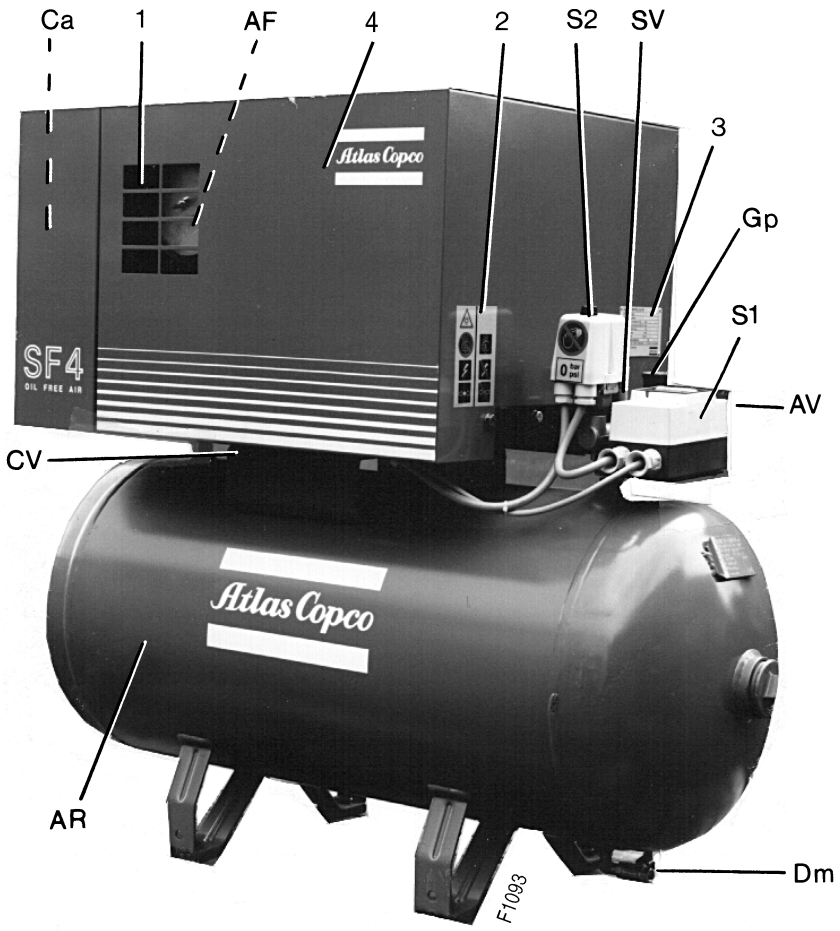


Fig. 2a. SF Standard

AF. Air filter
AR. Air receiver
AV. Air outlet valve
Ca. Air cooler
CV. Check valve
Dm. Condensate drain valve
Gp. Working pressure gauge
SV. Safety valve
S1. Circuit breaker
S2. Air pressure switch
1. Air inlet grating
2. Pictograph: never carry out any maintenance or repair when the unit is pressurized or the voltage is switched on
3. Data plate
4. Silencing hood
5. Frame

Figs. 2. Compressor variants

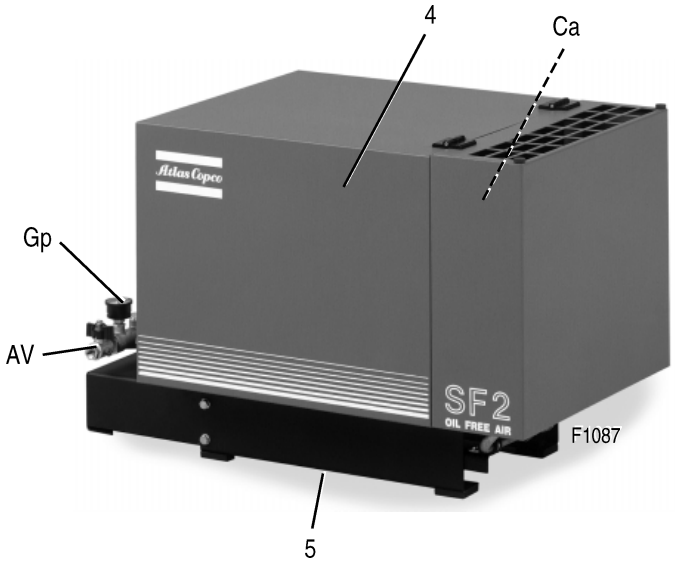


Fig. 2b. SF Skid

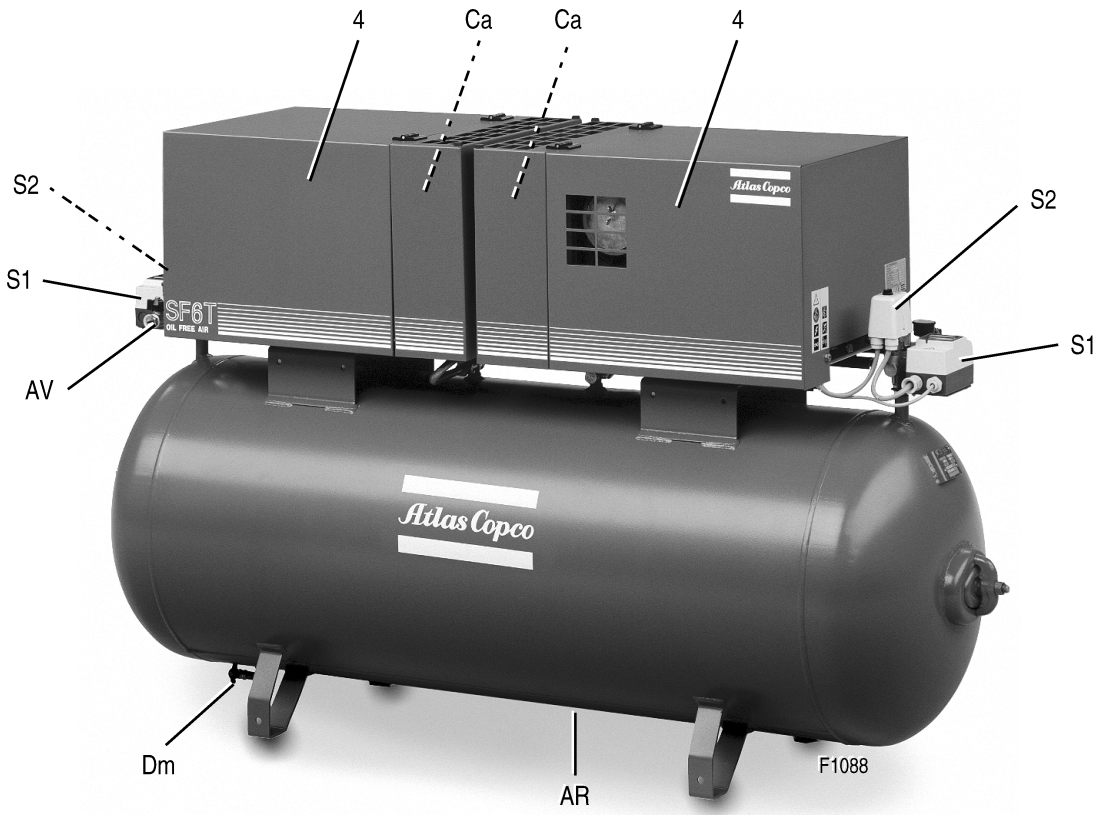


Fig. 2c. SF Twin

1.3 Cooling and condensate drain systems

SF Standard/Skid/Twin (Figs. 2 and 4)
The compressor element (E) is cooled by fan (FN1). The fan is mounted on the drive shaft of the compressor element. The cooling air is blown over the compressor element and air cooler (Ca) via duct (2).

SF Pack (Fig. 3a)
The compressor element (E) is cooled by fan (FN1). The fan is mounted on the drive shaft of the compressor element. The cooling air is blown over the compressor element and air cooler (Ca) via duct (2). A second fan (FN2), driven by an electric motor, expels warm cooling air from the bodywork.

SF Full-feature (Fig. 5)
The compressor element (E) is cooled by fan (FN1). The fan is mounted on the drive shaft of the compressor element. The cooling air is blown over the compressor element and air cooler via duct (2). A second fan (FN2), driven by an electric motor, expels warm cooling air from the bodywork. The compressed air circuit of the dryer is provided with a moisture trap (MT) with an automatic condensate drain valve (Da) and a manually operated valve (Dm1).

1.4 Regulating system (Figs. 2 and 3)

The air receiver pressure is kept within limits by pressure switch (S2 or PSR19). The switch is connected to the air outlet and electrically connected in the circuit of drive motor (M1). The switch opens and closes its contacts at pre-set pressures.

When the contacts are closed, the circuit to the drive motor is made: the compressor is operating. The air output is maximum.

When the pressure reaches the pre-set maximum, the circuit to the drive motor is broken, causing the compressor to stop. The air output is stopped.

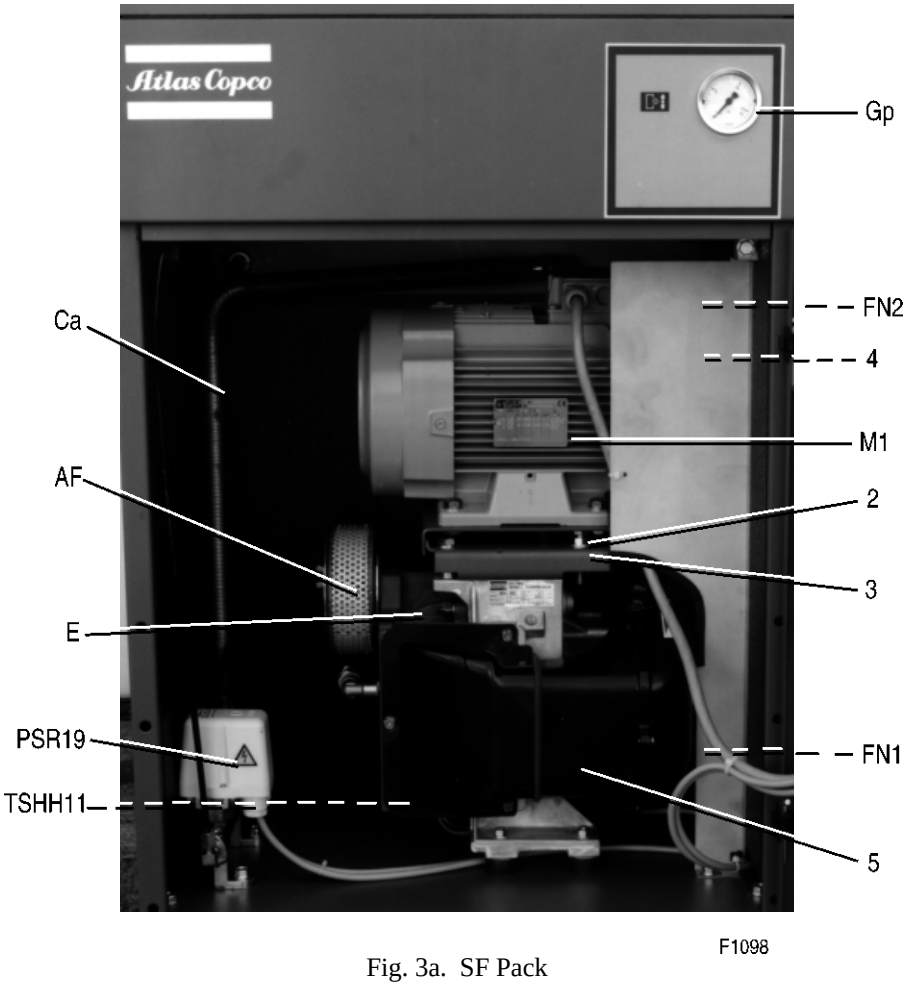


Fig. 3a. SF Pack

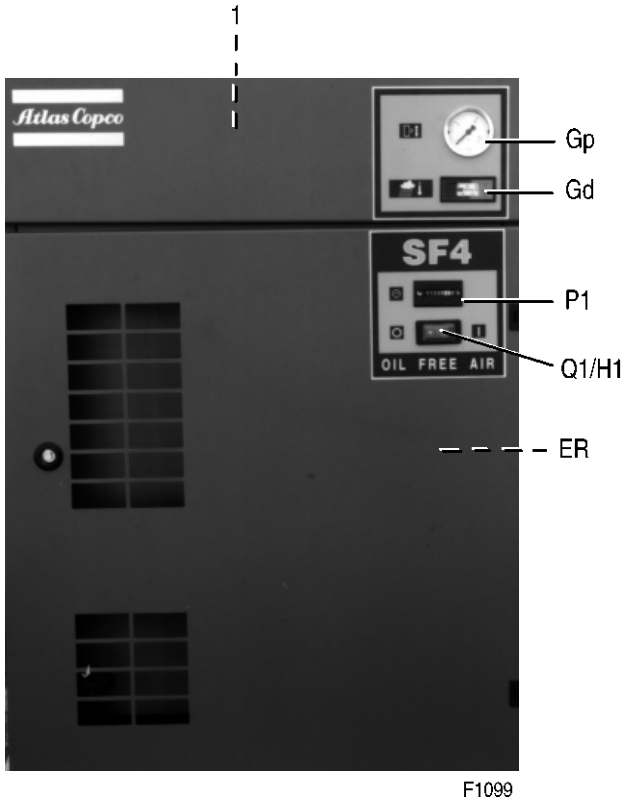
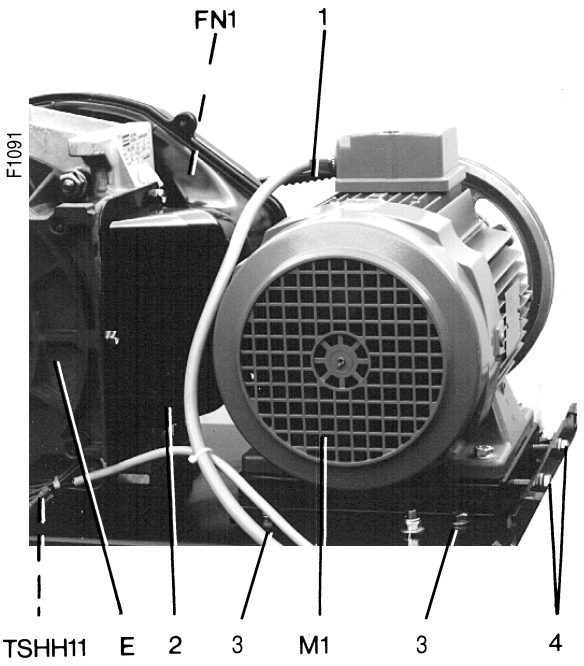


Fig. 3b. SF Full-feature

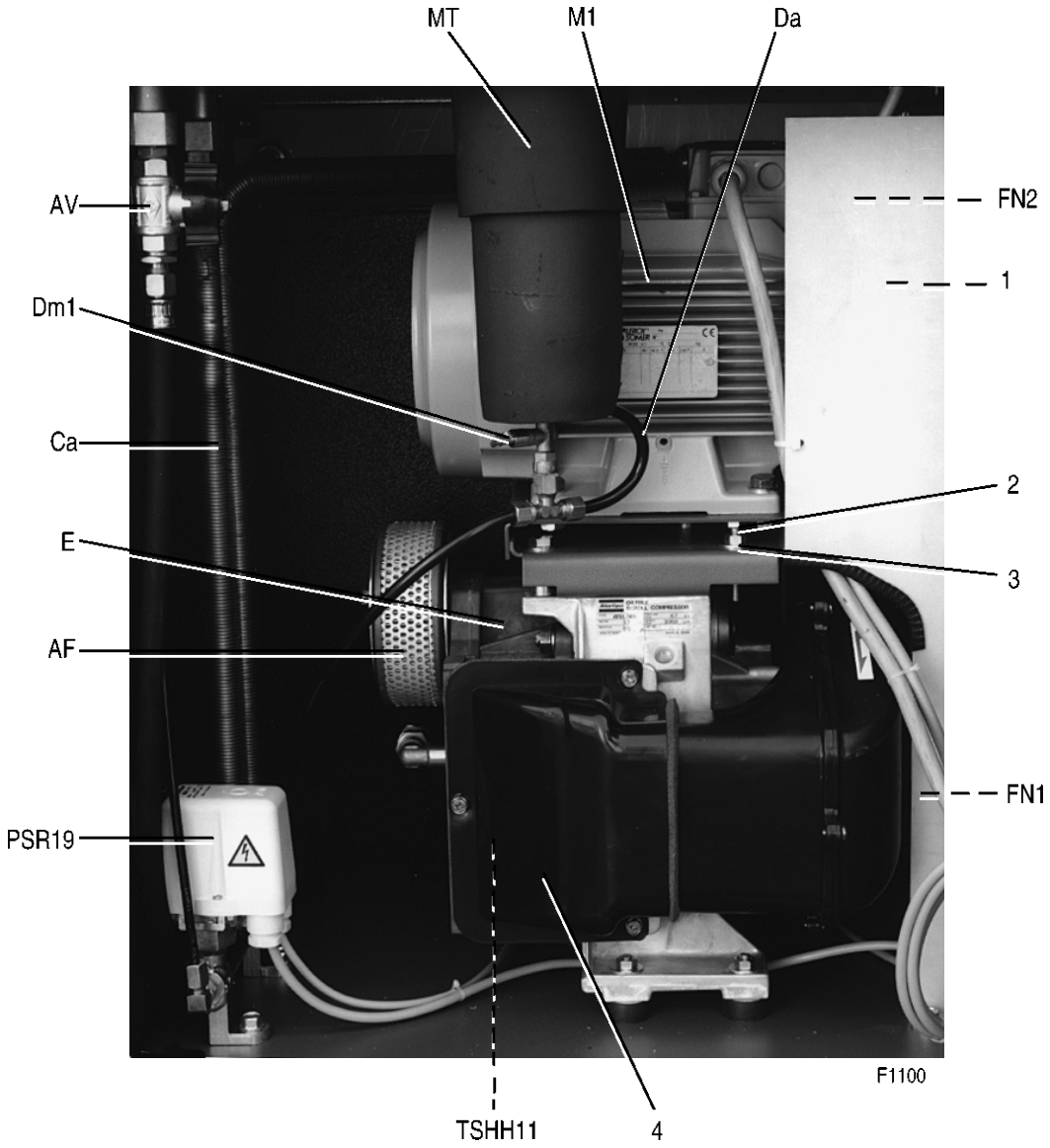
AF.	Air filter
Ca.	Air cooler
E.	Compressor element
ER.	Electric cubicle
FN1/2.	Cooling fans
Gd.	Dewpoint temperature gauge
Gp.	Working pressure gauge
H1.	On/off lamp
M1.	Drive motor
PSR19.	Air pressure switch
P1.	Hourmeter, motor running hours
TSHH11.	Temperature shut-down switch
Q1.	On/off switch
1.	Dryer
2.	Belt-tensioning bolt
3.	Lock nut
4.	Belts
5.	Cooling air duct

Figs. 3. Compressor variants



E. Compressor element
FN1. Cooling fan
M1. Drive motor
TSHH11. Temperature shut-down switch
1. Belt
2. Duct
3. Motor hold-down bolt
4. Aligning/tensioning bolts

Fig. 4. Drive motor, SF Standard/Skid/Twin



AF. Air filter
AV. Air outlet valve
Ca. Air cooler
Da. Automatic condensate drain
Dm1. Condensate drain valve
E. Compressor element
FN1/2. Cooling fans
MT. Moisture trap
M1. Drive motor
PSR19. Air pressure switch
TSHH11. Temperature shut-down switch
1. Belt
2. Belt-tensioning bolt
3. Lock nut
4. Cooling air duct

Fig. 5. SF Full-feature

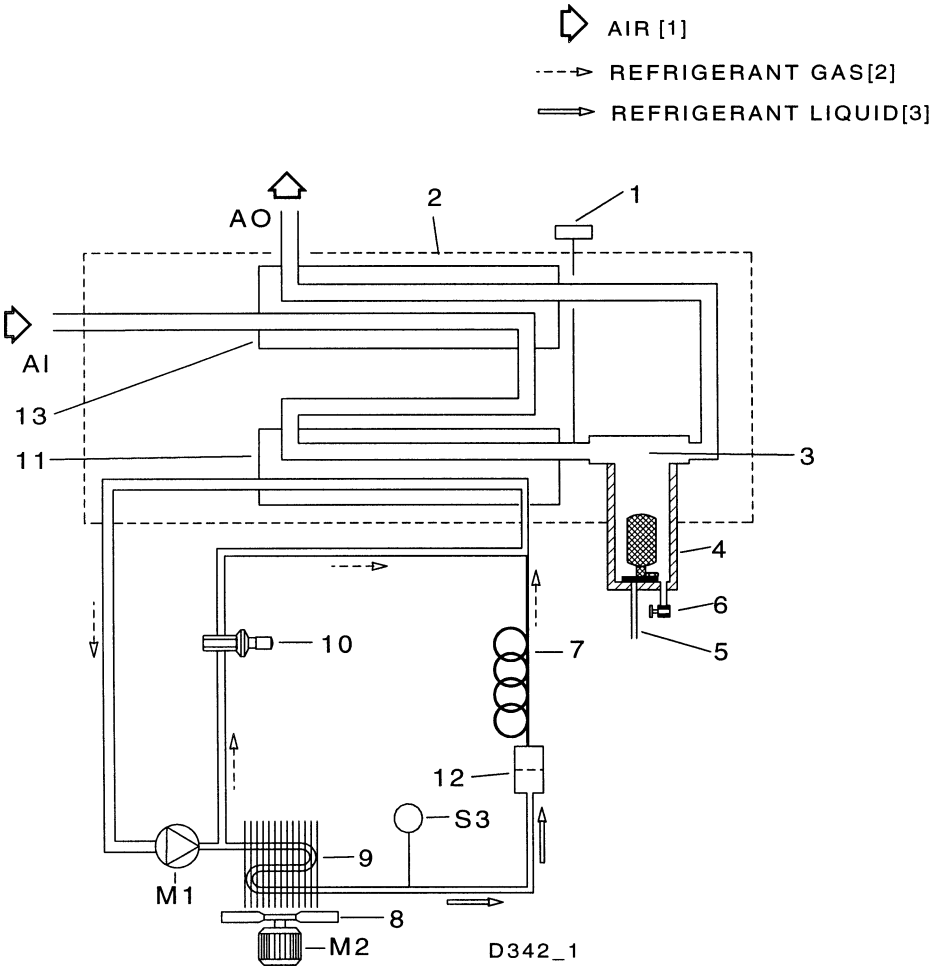


Fig. 6a. Flow diagram

AI. Wet air inlet
AO. Dry air outlet
FN1. Cooling fan
M1. Refrigerant compressor
M2. Condenser fan motor
S3. Fan control switch
1. Pressure dewpoint gauge
2. Insulating block
3. Condensate separator
4. Condensate trap
5. Automatic condensate drain hose
6. Manual condensate drain valve
7. Capillary tube
8. Condenser cooling fan
9. Refrigerant condenser
10. Hot gas by-pass valve
11. Air/refrigerant heat exchanger/evaporator
12. Liquid refrigerant dryer/ filter
13. Air/air heat exchanger

Figs. 6. Dryer on SF Full-feature

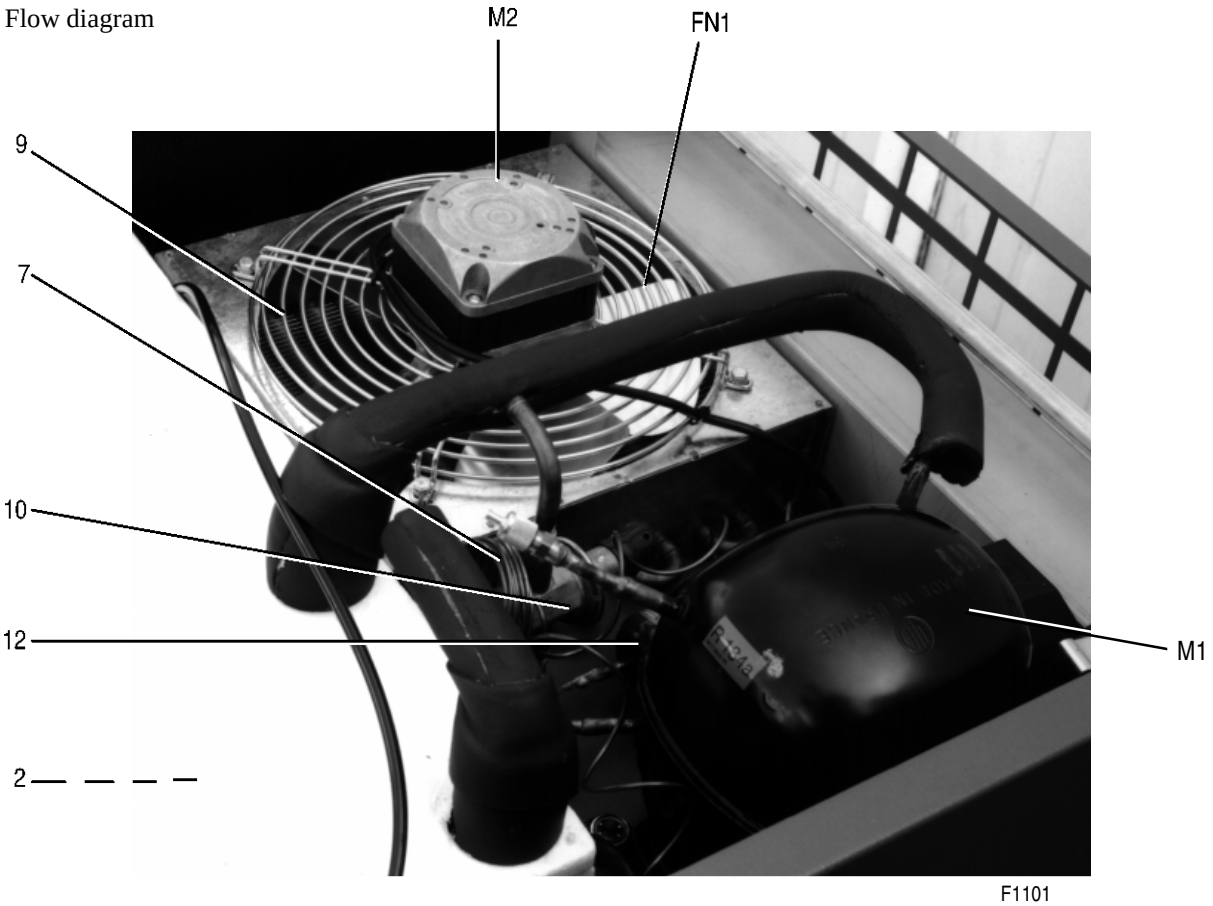


Fig. 6b. Dryer components

1.5 Air dryer on SF Full-feature (Figs. 6)

1.5.1 Compressed air circuit

Wet compressed air enters heat exchanger (13) and is cooled by the outgoing, cold, dried air. Water in the incoming air starts to condense. The air then flows through heat exchanger (11) where the refrigerant evaporates and withdraws heat from the air. More water in the air condenses. The cold air then flows through moisture trap (3) where the condensate is separated from the air. The condensate is automatically drained through outlet (5). The cold, dried air then flows through heat exchanger (13), where it is warmed up by the incoming air.

1.5.2 Refrigerant circuit

Compressor (M1) delivers hot, high-pressure refrigerant gas which flows through condenser (9) where most of the refrigerant condenses.

The liquid flows through liquid refrigerant dryer/filter (12) to capillary tube (7). The refrigerant leaves the capillary tube at evaporating pressure.

The refrigerant enters evaporator (11) where it withdraws heat from the compressed air by further evaporation at constant pressure. The heated refrigerant leaves the evaporator and is sucked in by the compressor.

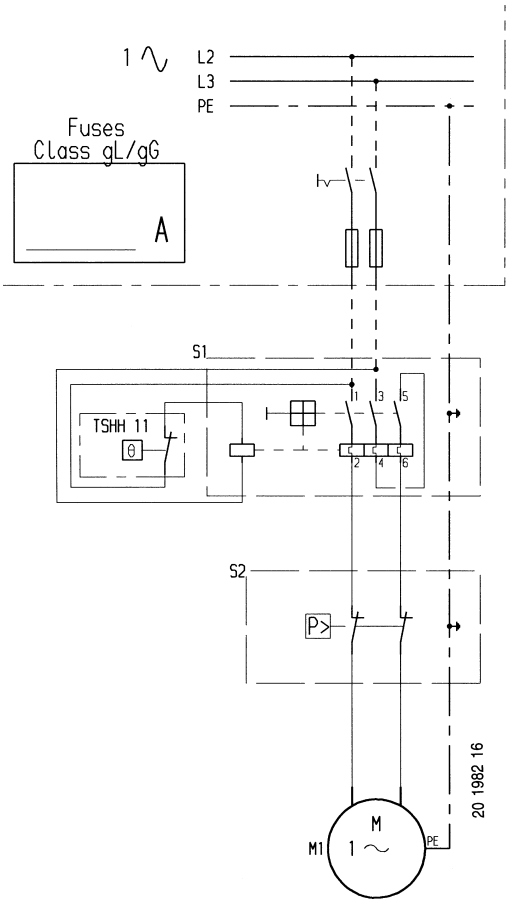


Fig. 7a. SF1 Single-phase

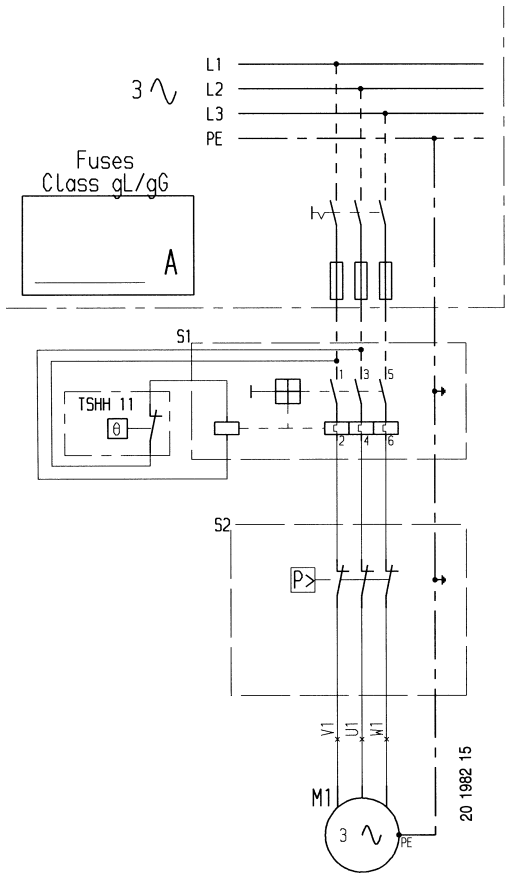


Fig. 7b. SF2/4 3-phase

M1. Drive motor
S1. Circuit breaker
S2. Pressure switch
TSHH11. Temperature shut-down switch

Figs. 7. Service diagrams for SF Standard/Skid/Twin

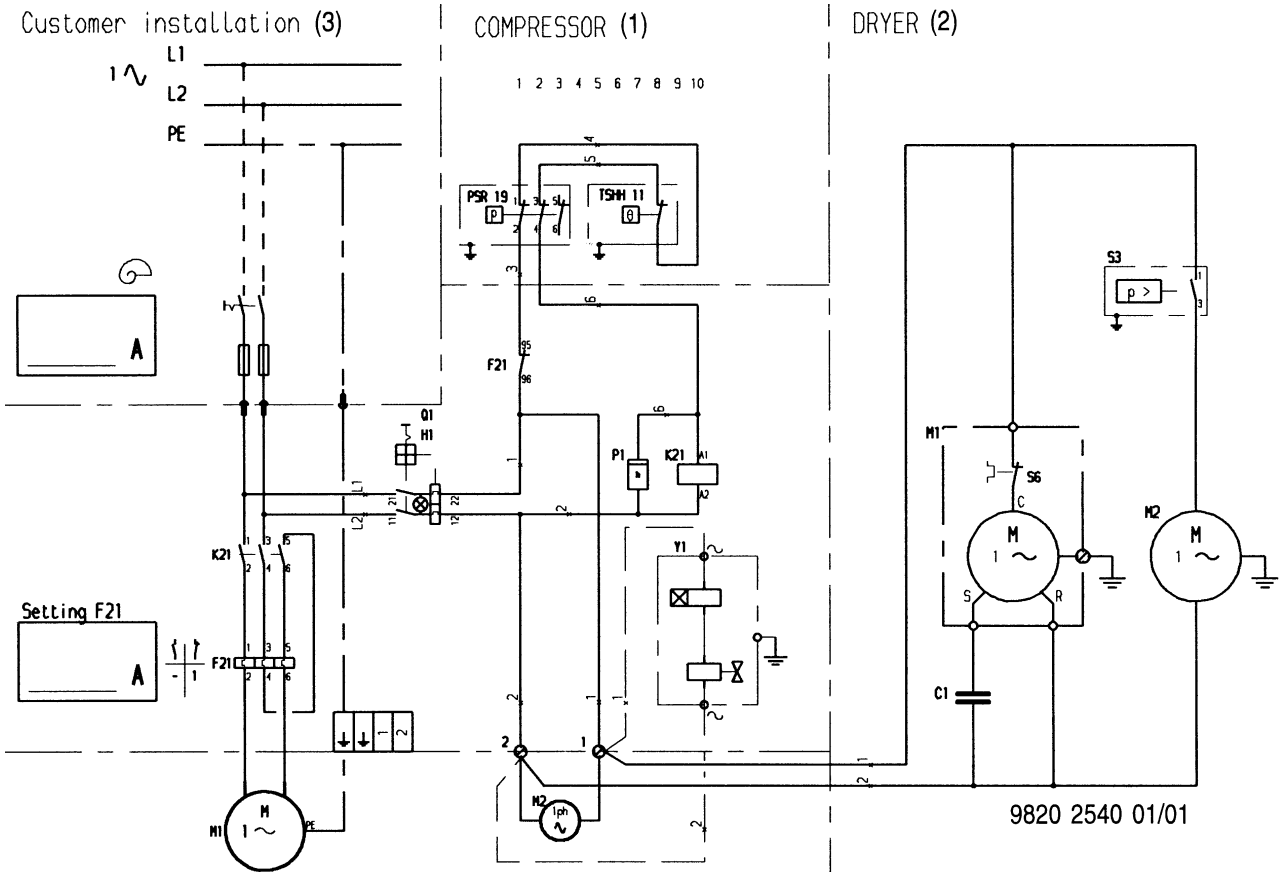


Fig. 8a. SF1 single-phase - 50 Hz

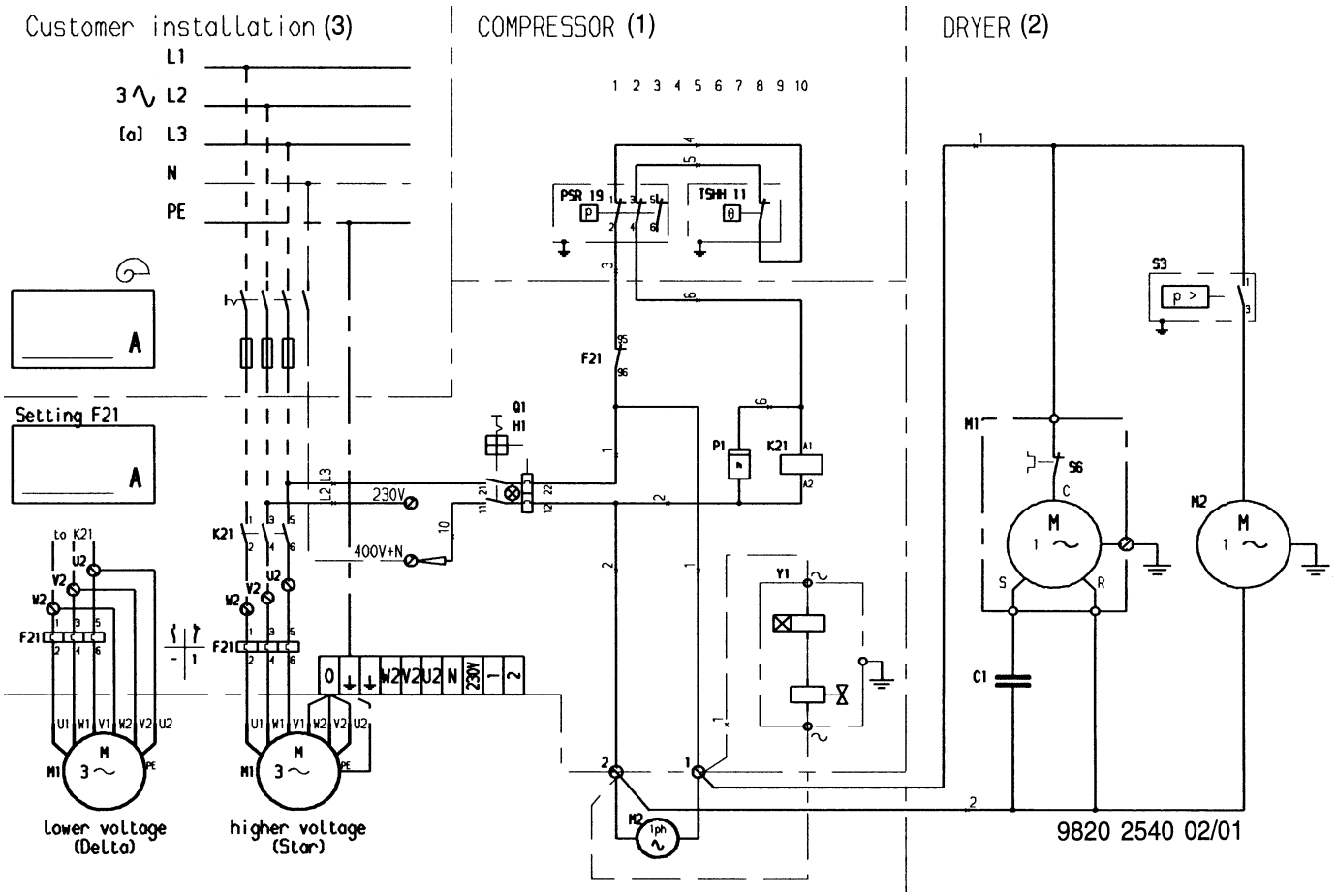


Fig. 8b. SF2/4 3-phase - 50 Hz

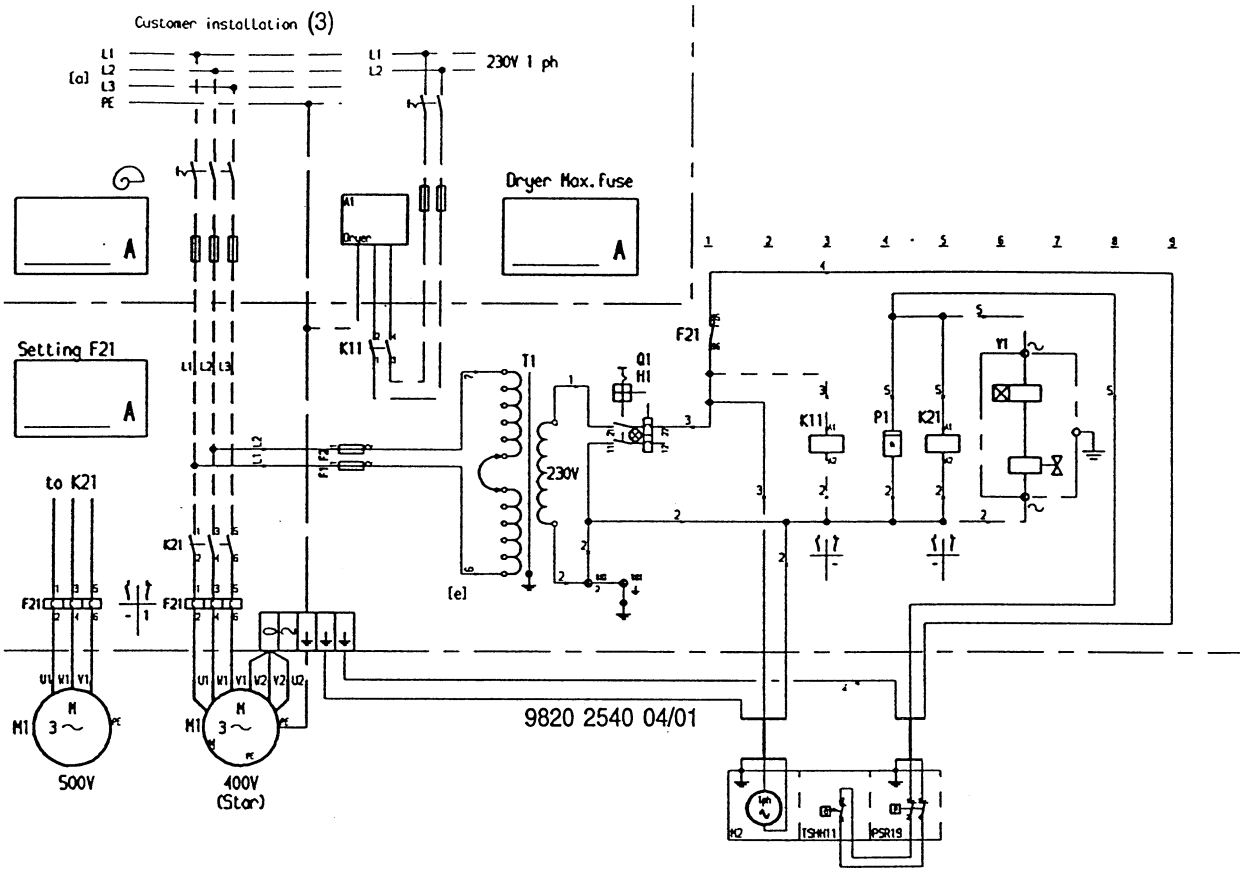


Fig. 8c. SF2/4 3-phase + external supply for dryer - 50 Hz

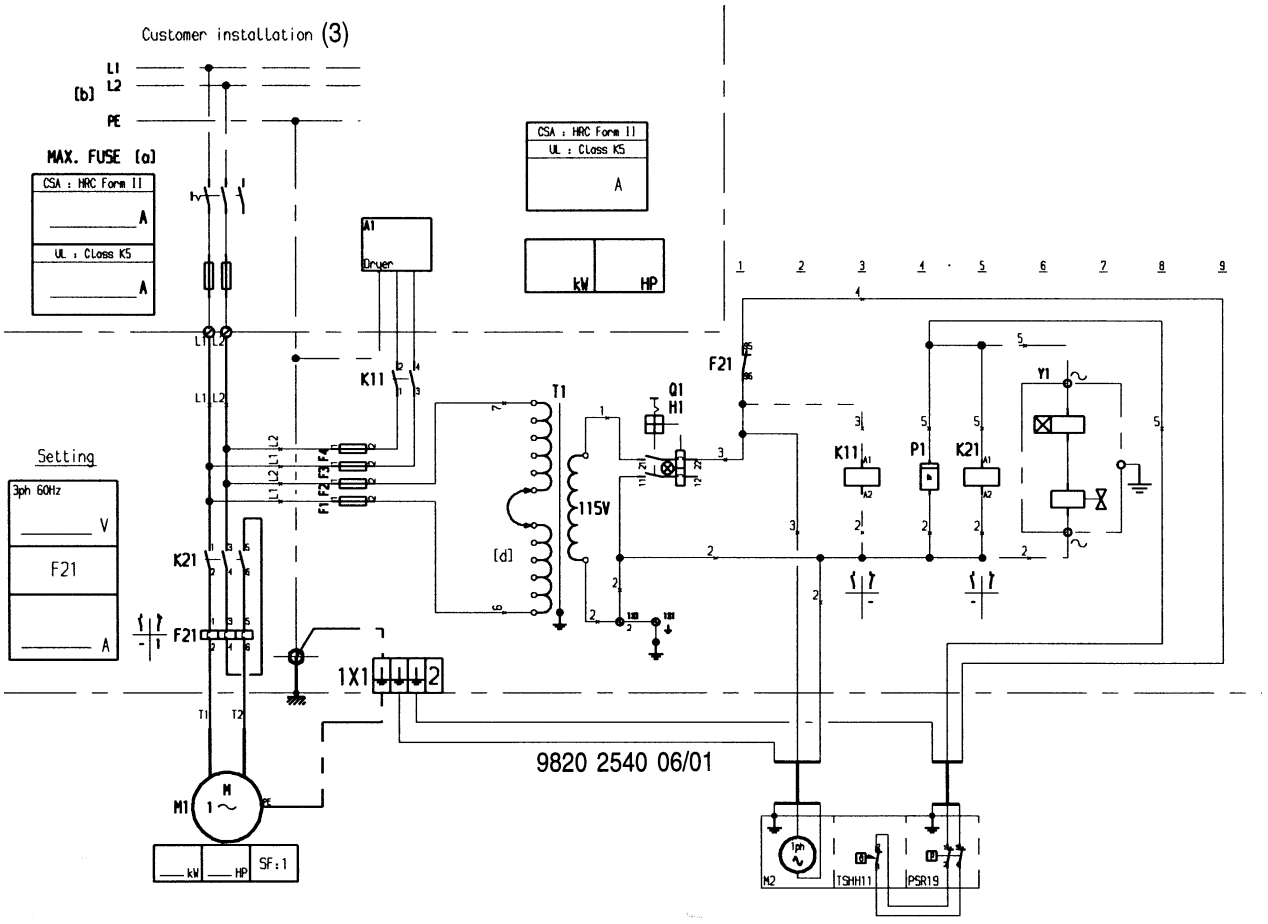


Fig. 8d. SF2 single-phase - 60 Hz

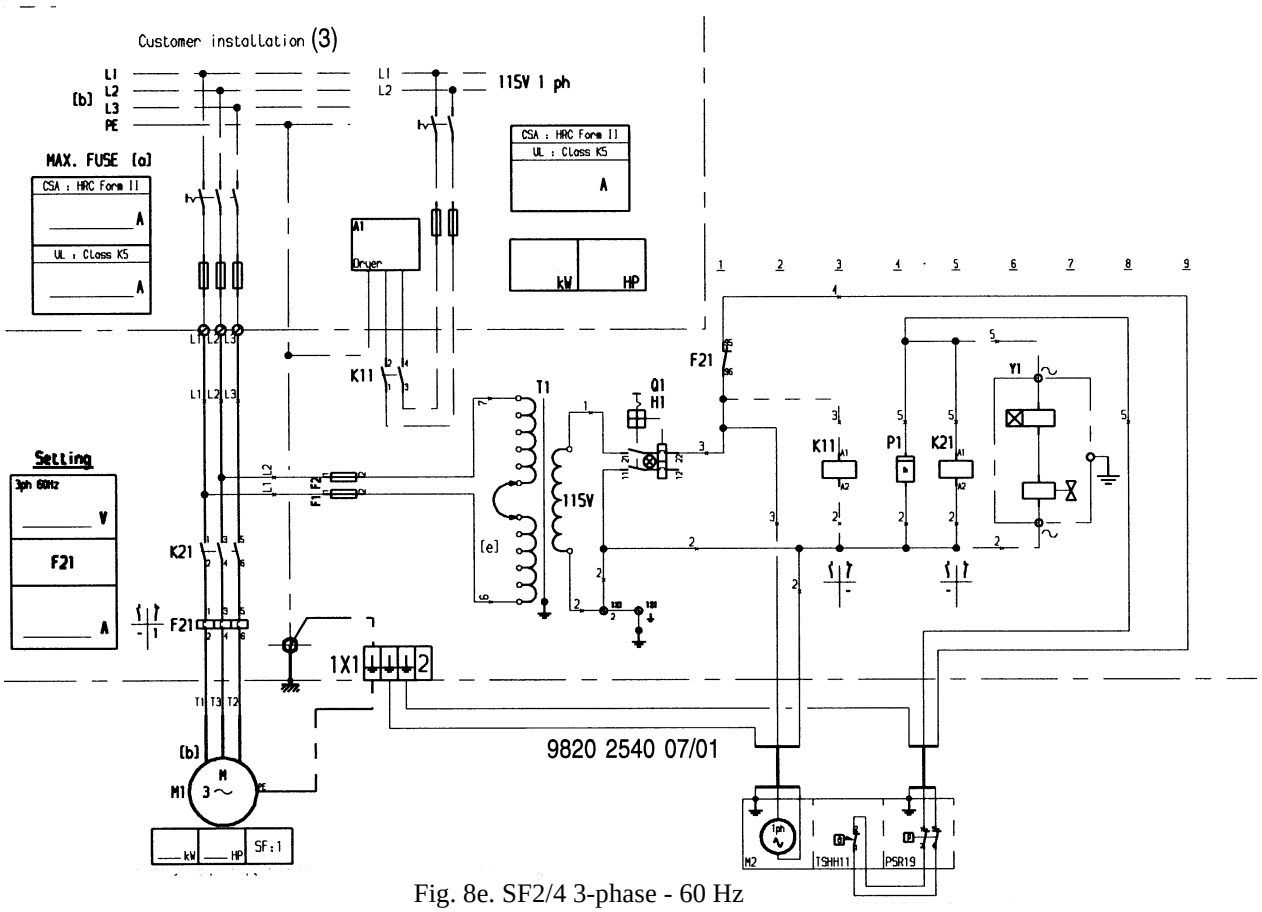


Fig. 8e. SF2/4 3-phase - 60 Hz

Compressor

F1/4. Fuses (60 Hz) **1)**
F21. Overload relay
H1. On/off lamp
K11. Contactor for dryer **2)**
K21. Contactor
M1. Drive motor
M2. Fan motor
PSR19. Air pressure switch
P1. Hourmeter, motor running hours
Q1. On/off switch
T1. Transformer (60 Hz)
TSHH11. Temperature shut-down switch
Y1. Electronic drain (optional)

Air dryer (A1)

C1. Capacitor
M1. Refrigerant compressor/motor
M2. Motor, condenser cooling fan
S3. Control switch, condenser cooling fan
S6. Thermal overload switch, motor of refrigerant compressor

1) F3/4 only for 230 V Full-feature - 60 Hz
2) For 60 Hz Full-feature

Figs. 8. Service diagrams for SF Pack/Full-feature

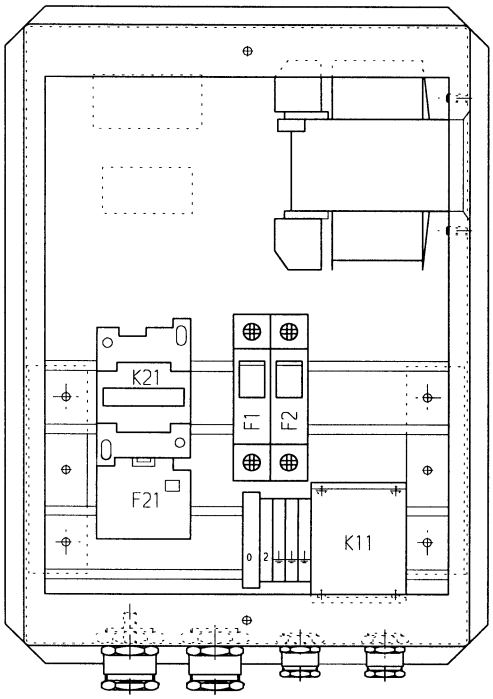


Fig. 9a. 50 Hz

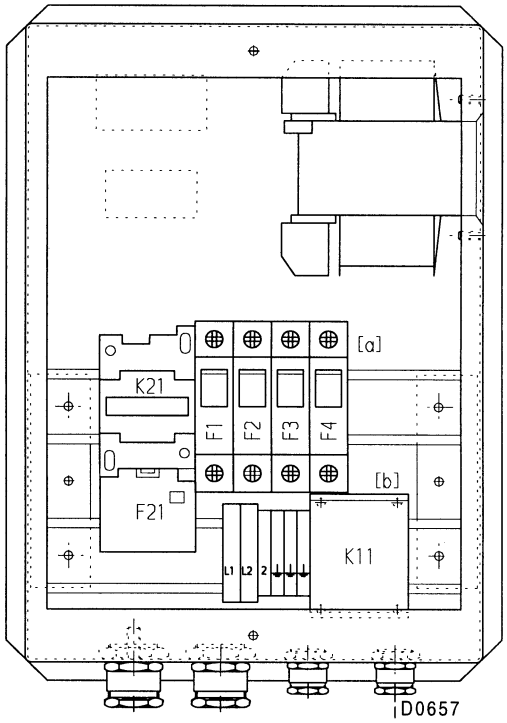
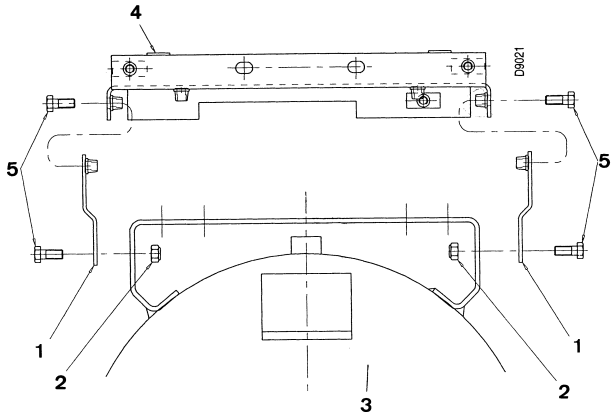


Fig. 9b. 60 Hz

See legend of Figs. 8

Figs. 9. Cubicles (typical examples)

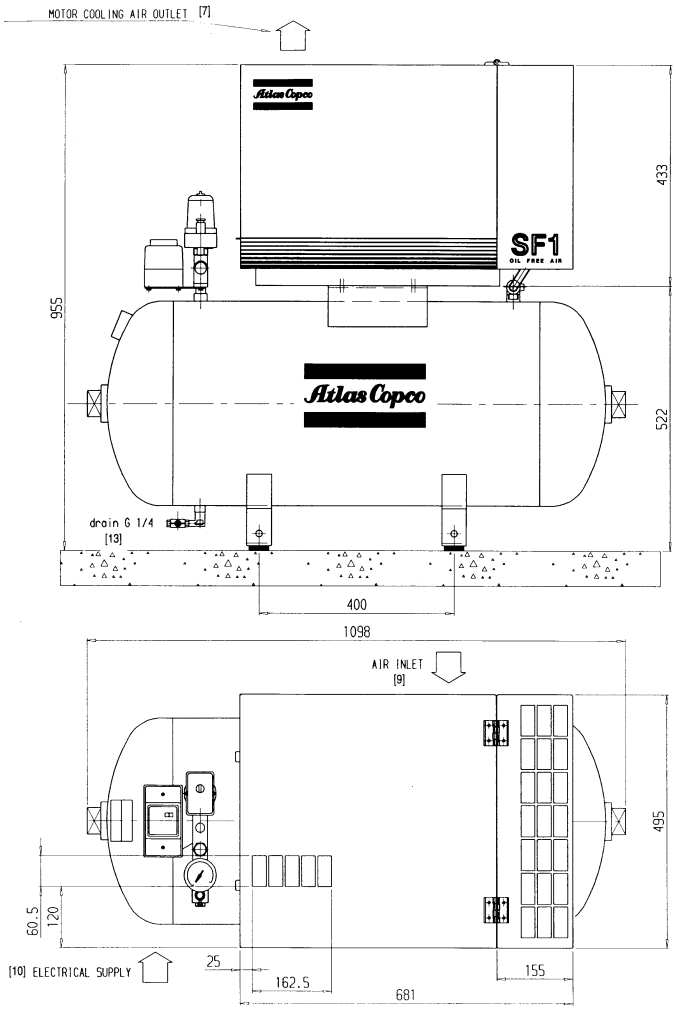


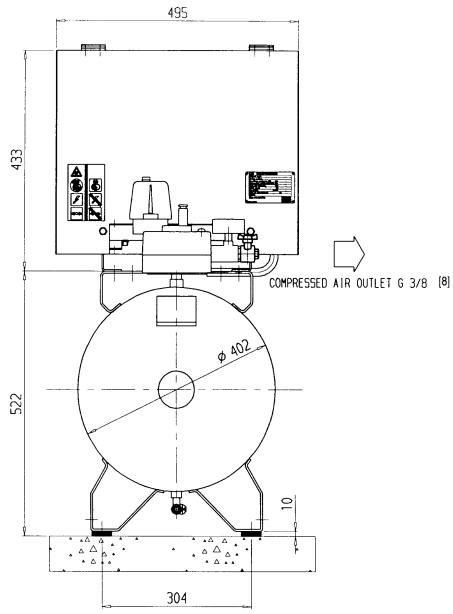
1. Transport bracket
2. Lock nut
3. Air receiver
4. Compressor frame
5. Bolts

Fig. 10. Transport bracket

2 INSTALLATION

2.1 Dimension drawings (Figs. 11)





Type	[14] Pressure	[15] Approx. mass
SF1-STD	8 BAR	129 kg
SF2-STD	8 BAR	129 kg
	10 BAR	129 kg
SF4-STD	8 BAR	139 kg
	10 BAR	139 kg

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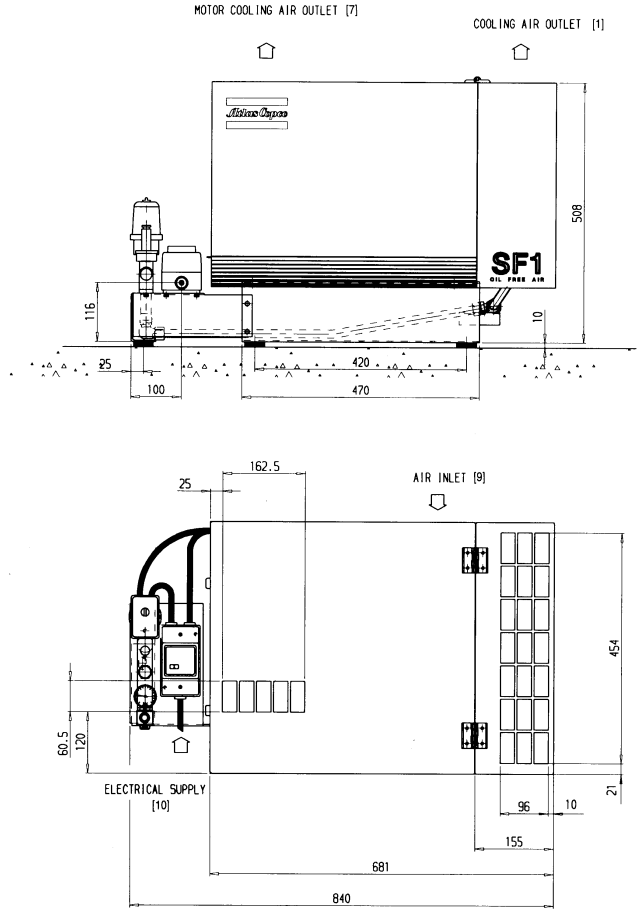
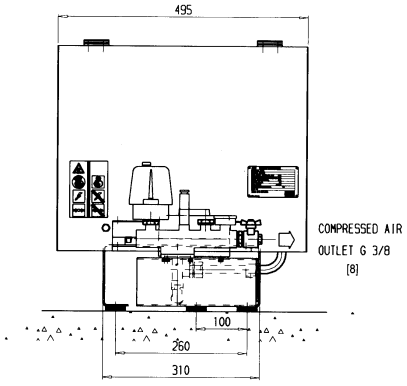
Fig. 11a. Dimension drawing, SF Standard





Type	[14] Pressure	[15] Approx. mass
SF1-SKID	8 BAR	70 kg
SF2-SKID	8 BAR	70 kg
	10 BAR	70 kg
SF4-SKID	8 BAR	80 kg
	10 BAR	80 kg

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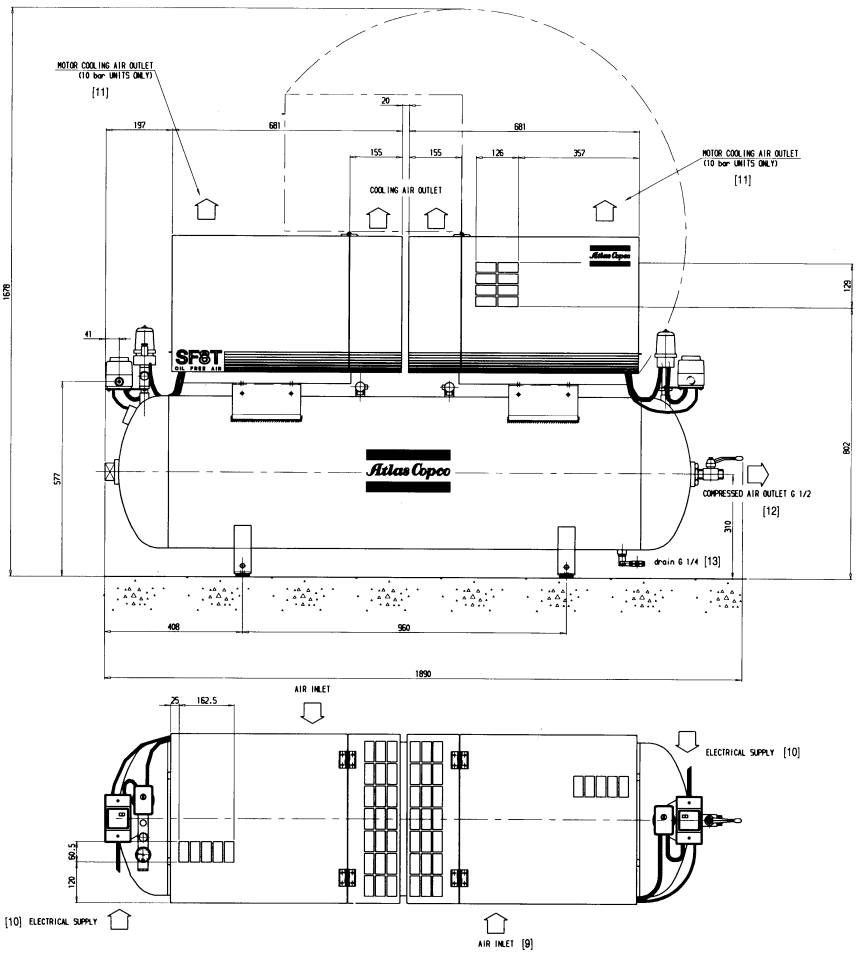
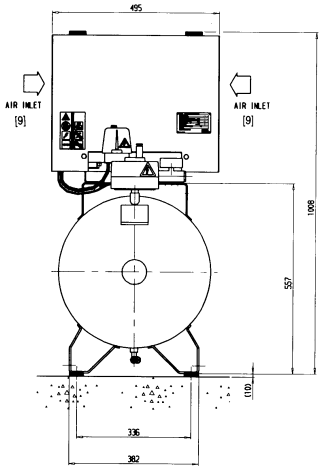
Fig. 11b. Dimension drawing, SF Skid

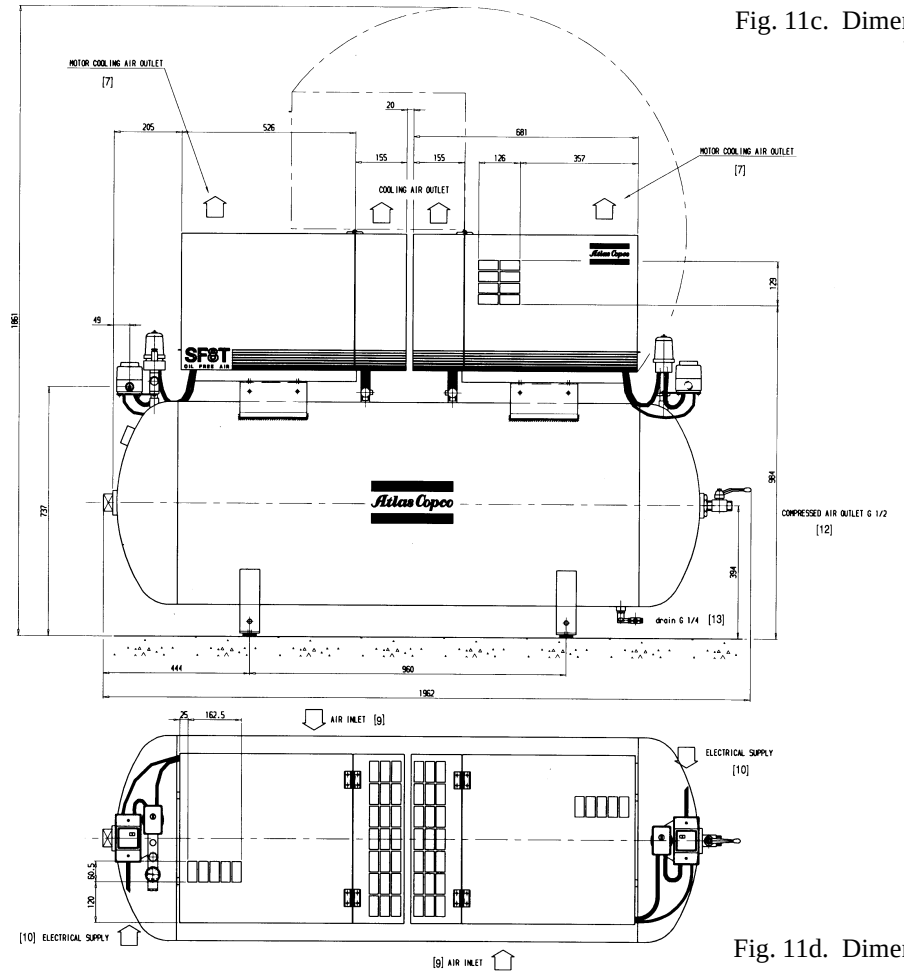


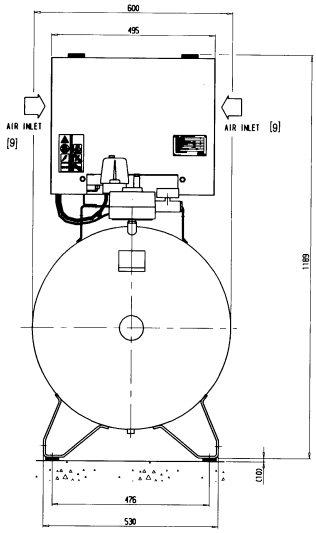


19 6002 00

Type	[14] Pressure	[15] Approx. mass
SF6-T/250L	8 BAR	257 kg
	10 BAR	257 kg
SF8-T/250L	8 BAR	267 kg
	10 BAR	267 kg

Fig. 11c. Dimension drawing, SF Twin on 250 l receiver





19 6001 00

Type	[14] Pressure	[15] Approx. mass
SF6-T/475L	8 BAR	330 kg
	10 BAR	330 kg
SF8-T/475L	8 BAR	340 kg
	10 BAR	340 kg

Fig. 11d. Dimension drawing, SF Twin on 475 l receiver

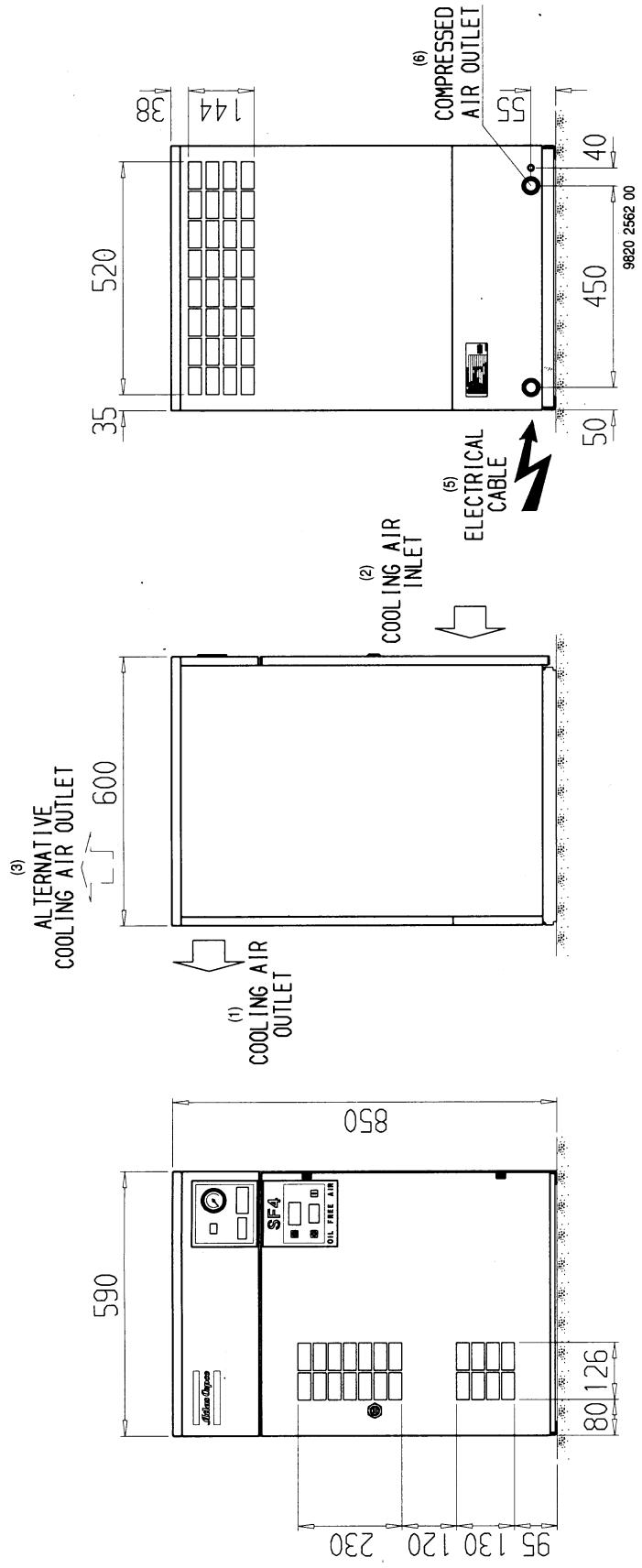


Fig. 11e. Dimension drawing, SF Pack and Full-feature

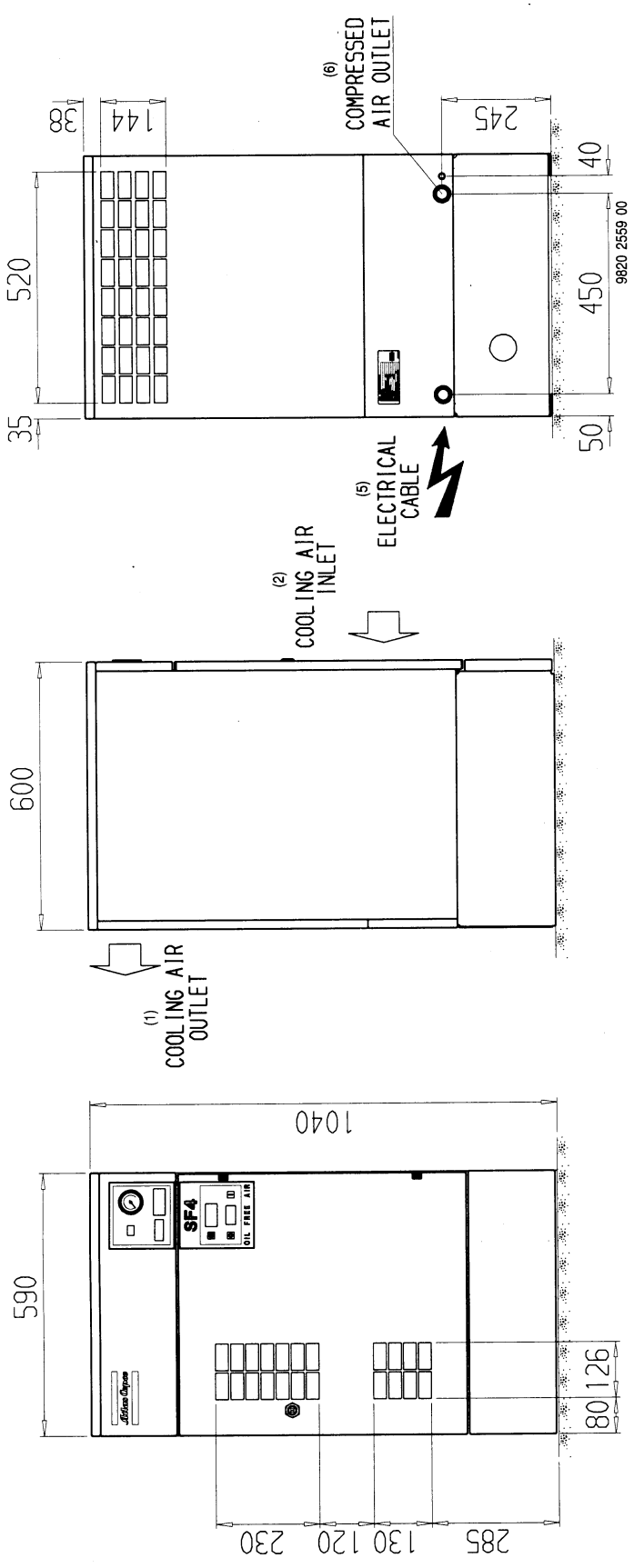


Fig. 11f. Dimension drawing, SF Pack and Full-feature with optional air receiver

2.2 Installation alternatives for SF Pack/Full-feature (Fig. 12)

The roof panel of the compressor is a fully closed panel, whereas the back panel is provided with ventilation openings. Both panels are interchangeable.

ALTERNATIVE 1
The closed panel is used as roof panel. Ventilation is possible through openings in the back panel. A ventilation space of minimum 200 mm must exist between the compressor and the wall.

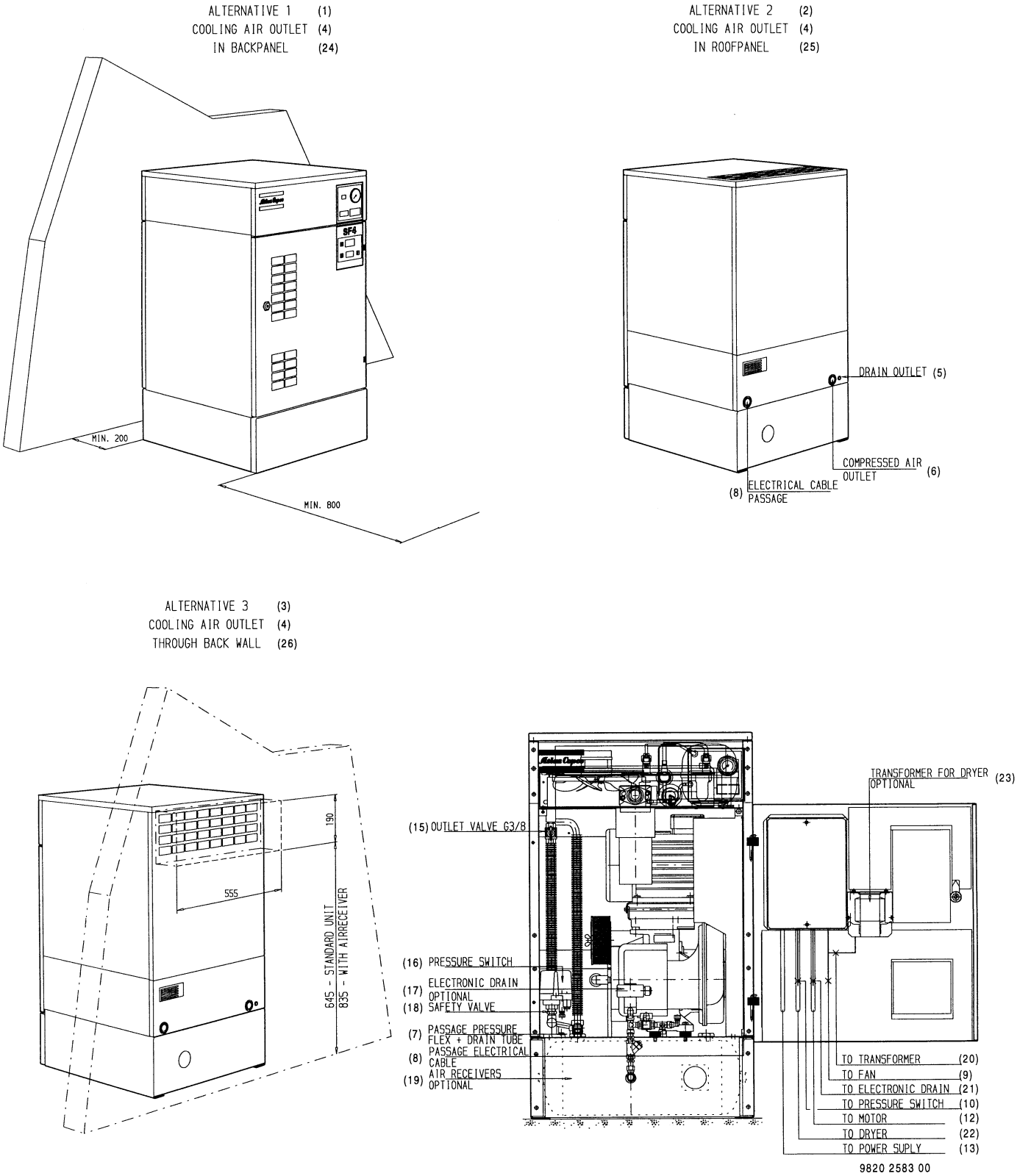


Fig. 12. Installation proposal

ALTERNATIVE 2
The panel provided with ventilation openings is used as roof panel. This allows the compressor to be placed against a wall.

ALTERNATIVE 3
The closed panel is used as roof panel. Installing the compressor against a wall is allowed if a ventilation opening is provided in the wall behind the compressor. This opening must have following minimum dimensions:
- 555 mm horizontally
- 190 mm vertically

On SF Pack compressors, this opening must be 645 mm above floor level, for SF Pack compressors with optional air receiver, the opening must be 835 mm above floor level.

2.3 Recommendations

1. Install the compressor on a level floor, in a cool but frost-free room which is well-ventilated. The air should be clean. Remove the red-painted transport brackets. **On SF Standard/Twin**, remove transport brackets (1-Fig. 10).

2. **SF Pack and Full-feature** may be installed against a wall. Provide for sufficient cooling. See section 2.2.

3. The maximum total pipe length can be calculated as follows:

$$L = \frac{\Delta P \times d^5 \times P}{450 \times Qc^{1.85}}$$

L = pipe length in m
ΔP = maximum allowable pressure drop (recommended 0.1 bar)
d = inner diameter of pipe in mm
P = compressor outlet pressure in bar absolute
Qc = free air delivery of compressor in l/s

4. Ventilation: the inlet grids and fan for compressor room ventilation should be installed in such a way that any recirculation of cooling air to the compressor or dryer is avoided. The air velocity to the grids must be limited to 5 m/s. The maximum allowable pressure drop over the cooling air ducts is 30 Pa. The maximum air temperature at the compressor intake opening is 40°C.

   The required ventilation capacity to limit the compressor room temperature can be calculated as follows:

$$Qv = 0.92\ N/\Delta T$$

Qv = required ventilation capacity in m^3/s
N = shaft input of compressor in kW
ΔT = temperature increase in compressor room in °C

5. Connect the compressed air equipment to the air outlet valve (AV-Figs. 2 and 15).

6. Connect condensate drain valve (Dm-Figs. 2) to a sewer. It is recommended to provide a funnel to allow visual inspection of the condensate flow.
   If the condensate piping has been led outside the compressor room where it may be exposed to freezing temperatures, the piping must be insulated. The condensate drain pipe(s) from the compressor to the sewer must not dip into the water of the sewer. An optional electronically controlled condensate drain to flush the receiver at pre-set intervals may be installed.

7. An air receiver may be required to limit the number of starts per hour (which is maximum 20).

8. Optional filters can be installed in the pressure line downstream of the air outlet valve, e.g.:
   - A DD filter for general-purpose filtration. The filter traps solid particles down to 1 micron.
   - A PD filter for filtration down to 0.01 micron. A PD filter must be installed downstream of a DD filter.

2.4 Electrical connections

2.4.1 Installation

The electrical installation must correspond to the local codes. The mains supply and earthing lines must be of suitable size. See section 7.3.

The installation must be earthed and protected by fuses in each phase. An isolating switch should be installed near the compressor.

2.4.2 Connection of drive motor

On SF2/4 Pack and Full-feature - 230 V and 400 V 50 Hz, (Fig. 8b), the drive motor (M1) has been designed for connection to a 3-phase 400 V or 230 V mains. **The motor is wired ex-factory for the higher voltage.**

For operation at the lower voltage, proceed as follows before connecting the compressor to the mains:

- Open the front door.
- The wires marked U2, V2 and W2 are connected to terminal (O). Loosen these wires and connect each wire to its terminal (U2, V2 and W2 respectively).
- Disconnect wire (10) from terminal (N) and connect it to terminal (230 V).
- Close the front door.

2.4.3 Supply cable

For the size of the supply cable, consult section 7.3.

SF Standard/Skid/Twin (Figs. 7)
Connect the cable to terminals 1 and 3 (single-phase) or to

terminals 1, 3 and 5 (3-phase) of circuit breaker (S1-Figs. 2 and 15). Connect the earthing conductor to the earthing terminal. **SF Twin** have a circuit breaker for each compressor module; provide for each circuit breaker separate supply cables.

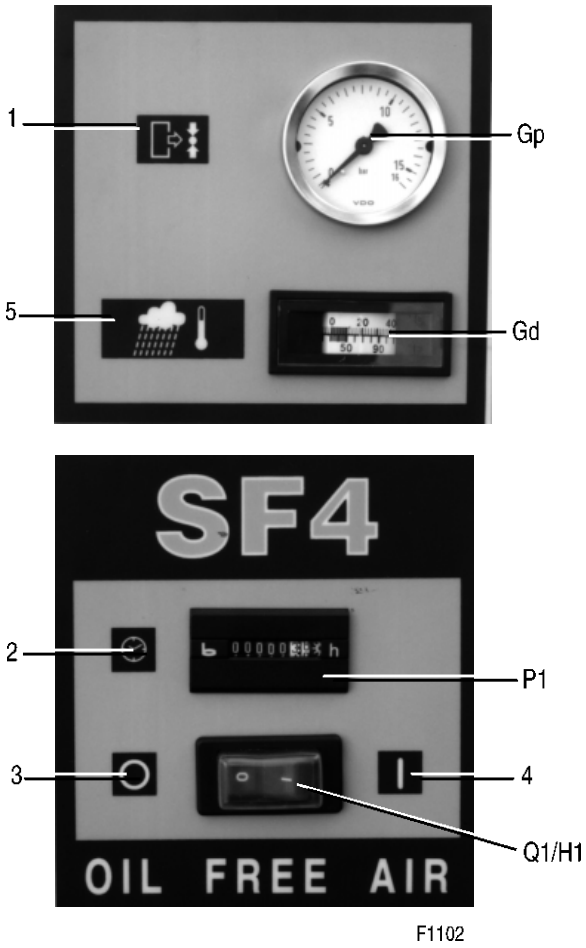
SF Pack/Full-feature - 50 Hz (Figs. 8a/8b/8c)
Connect the cable to terminals 1 and 3 (single-phase) or to terminals 1, 3 and 5 (3-phase) of contactor (K21-Fig. 9a). Connect the neutral conductor (if provided) to terminal (N) and the earthing conductor to the earthing terminal.

SF Pack/Full-feature - 60 Hz (Figs. 8d/8e)
Connect the cable to terminals L1 and L2 (single-phase) or to terminals L1, L2 and L3 (3-phase). Connect the earthing conductor to the earthing terminal.

The voltage supply to the dryer of **SF Full-feature** must be 230 V single-phase:
- in case of a 3 x 230 V mains, the dryer supply is branched off between two phase conductors
- for other mains voltages, provide a separate 230 V supply with fuses to the dryer

2.5 Pictographs

Fig. 14 shows typical examples of pictographs which may be used on the machine. Also consult Fig. 13.



Gd. Dewpoint temperature gauge
Gp. Working pressure gauge
P1. Hourmeter, working hours
Q1/H1. On/off switch - lamp

Pictographs for
1. Working pressure
2. Hourmeter
3. Compressor off
4. Compressor on
5. Dewpoint temperature

Fig. 13. Control panel for SF Pack and Full-feature

1. Manual condensate drain
2. Automatic condensate drain
3. Switch off voltage and depressurize compressor before maintenance or repair
4. Before connecting compressor electrically, consult instruction book for motor rotation direction
5. Torques for steel (Fe) or brass (CuZn) bolts
6. Warning, voltage
7. Consult Instruction book before greasing
8. Never adjust switch if it is depressurized

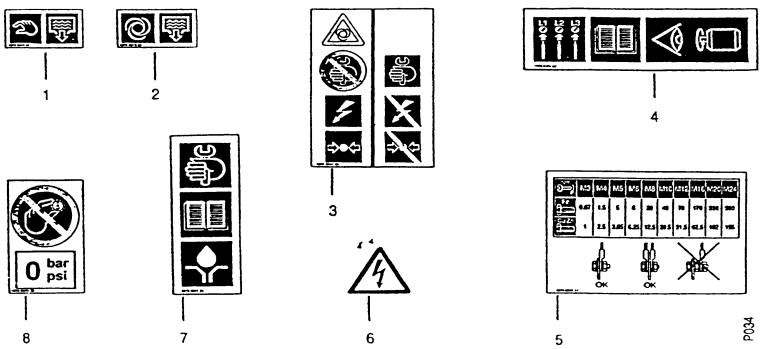


Fig. 14. Pictographs

3 OPERATING INSTRUCTIONS

Safety precautions
The operator must apply all relevant safety precautions, including those mentioned in this book.

Outdoor/altitude operation
If the compressor is installed outdoors or if the air inlet temperature can be below 0°C (32°F), precautions must be taken. In this case, and also if operating at high altitude, consult Atlas Copco.

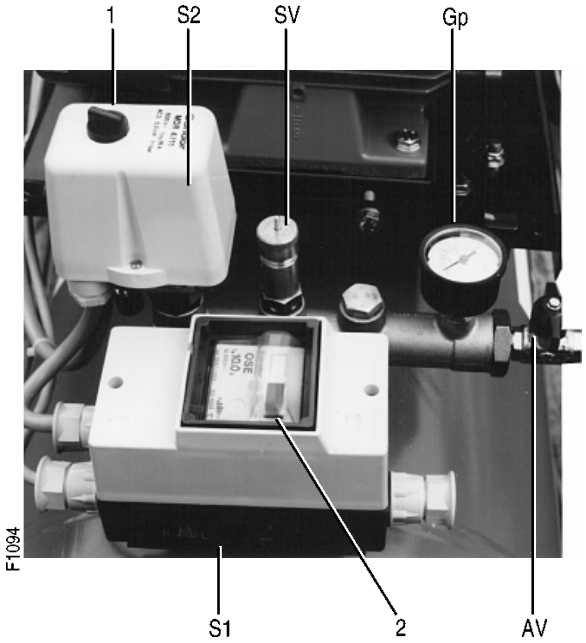
3.1 Initial start-up

1. Close air outlet valve (AV-Figs. 2, 5 and 15).
2. Check the setting of the overload relay (F21-Figs. 9) or circuit breaker (S1-Figs. 2 and 15). Check the drive motor connections. Connect the compressor electrically. See section 2.4.
3. Close condensate drain valve (Dm-Fig. 2) (if provided), and **on SF Full-feature** also valve (Dm1-Fig. 5).
4. For **SF Standard/Skid/Twin**, push the "On" button (2-Fig. 15) of circuit breaker (S1).
5. Switch on the voltage. Start and stop the compressor by means of switch (Q1-Fig. 13) or switch (1-Fig. 15). Check the drive motor (M1-Figs. 3 and 4) for correct direction of rotation, which must be counter-clockwise when facing the drive end shaft of the motor. An arrow is provided on the cooling duct. If the rotation direction is wrong, switch off the voltage and reverse two incoming electric lines.

3.2 Starting

On SF Standard/Skid/Twin
1. If an air receiver is installed, check that the condensate drain valve is closed.
2. Open air outlet valve (AV-Figs. 2).
3. Switch on the voltage. Move switch (1-Fig. 15) to "I". The compressor starts.
4. The drive motor will automatically stop and start depending on the air pressure.

On SF Pack/Full-feature
1. If an air receiver is installed, check that the condensate drain valve is closed.
2. **On SF Full-feature**, also close condensate drain valve (Dm1-Fig. 5).
3. Open air outlet valve (AV-Fig. 5).
4. Switch on the voltage.
5. Move toggle switch (Q1-Fig. 13) to position "I". The compressor starts; check that lamp (H1) is alight.
6. The drive motor will automatically stop and start depending on the air pressure.
7. **On SF Full-feature**, the nominal pressure dewpoint (Gd-Fig. 3b) will be reached after a few minutes.



AV. Air outlet valve
Gp. Working pressure gauge
SV. Safety valve
S1. Circuit breaker
S2. Air pressure switch
1. On/off switch
2. On button

Fig. 15. Safety devices for SF Standard/Skid/Twin

Note: The maximum number of compressor starts is 20 per hour.

3.3 During operation

On SF Standard/Skid/Twin
1. Check the unloading and loading pressures (Gp-Figs. 2).
2. Regularly drain the condensate: open drain valve (Dm-Figs. 2) for a few seconds; close the valve after draining.

On SF Pack/Full-feature
1. Check the unloading and loading pressures (Gp-Figs. 3).
2. **On SF Full-feature**, check the pressure dewpoint (Gd-Fig. 3b).
3. If an air receiver is installed, drain the condensate regularly: stop the compressor, switch off the voltage and open the drain valve for a few seconds. **On SF Full-feature,** also open drain valve (Dm1-Fig. 5); close the valves after draining.
4. **On SF Full-feature**, check that condensate is discharged automatically from outlet (Da-Fig. 5) during loading **1)**.

1) The amount of condensate depends on the moisture content of the intake air.

Note: The dewpoint will deviate from nominal when the nominal conditions are exceeded. If the dewpoint remains too high or unstable, consult section 6.

3.4 Stopping

On SF Standard/Skid/Twin

1. Move switch (1-Fig. 15) to "O". The compressor stops.
2. Switch off the voltage.
3. Close air outlet valve (AV-Figs. 2).
4. If an air receiver is installed, open drain valve (Dm-Figs. 2)

On SF Pack/Full-feature

1. Move toggle switch (Q1-Fig. 13) to position "O". The compressor stops.
2. Switch off the voltage.
3. Close air outlet valve (AV-Fig. 5).
4. If an air receiver is installed, open the drain valve. **On SF Full-feature**, also open condensate drain valve (Dm1-Fig. 5).

3.5 Taking out of operation at end of compressor service life

1. Stop the compressor and close the air outlet valve.
2. Switch off the voltage and disconnect the compressor from the mains.
3. Depressurize the compressor. If an air receiver is installed, open its drain valve. **On SF Full-feature,** open manual drain valve (Dm1-Fig. 5).
4. If provided, shut off and depressurize the part of the air net which is connected to the outlet valve. Disconnect the compressor air outlet from the air net.
5. If provided, disconnect the compressor condensate piping from the local condensate drain system.

4 MAINTENANCE

The operator must apply all relevant safety precautions, including those mentioned in this book.

Before starting any repair or maintenance:

1. Switch off the voltage and safeguard against unintentional "switch-on".
2. Isolate the compressor by closing outlet valve (AV-Figs. 2 and 5).
3. For compressors with a separate voltage supply to the air dryer (see section 2.4), make sure that the voltage to the dryer is also switched off.
4. Depressurize the system, if an air receiver is installed, open its drain valve. **On SF Full-feature,** open valve (Dm1-Fig. 5).

On SF Full-feature: when handling refrigerant R134a, special safety precautions must be taken:

- Contact of refrigerant with the skin will cause freezing. Special gloves must be worn.
- Fluid refrigerant will cause freezing of the eyes; therefore, safety glasses are a must.
- Refrigerant R134a is poisonous. Do not inhale refrigerant vapours. Make sure that the working area is adequately ventilated. Maintenance and repair on the refrigerant circuit must only be carried out by qualified personnel.

4.1 Compressor drive motor

Refer to the motor data plate. The motor bearings are greased for life.

4.2 Preventive maintenance schedule for the compressor 1)

The schedule comprises a summary of the maintenance instructions. **Read the respective section before taking maintenance measures. The "longer interval" checks must also include the "shorter interval" checks.** When servicing, replace all disengaged packings, e.g. gaskets, O-rings, washers.

Period 2)	Running hours 2)	See section	See note	Operation
Daily	--	3.3/3.4	--	Drain condensate
"	--	7.6/7.7	--	**On SF Full-feature,** check dewpoint gauge
Monthly	**250**	5.2	2	Inspect air filter
3-monthly	**500**	--	1	Check pressure drop over Atlas Copco filters (optional)
6-monthly	--	5.5	3	Operate safety valve
"	--	--	4	Clean compressor
"	--	--	--	**On SF Full-feature,** brush or blow off the finned surface of the condenser
"	--	--	--	**On SF Full-feature,** clean moisture trap internally
Yearly	--	5.5	--	Test safety valve
"	--	--	--	Have electrical components/shut-down switch tested
"	**2500**	5.2	--	Replace air filter
"	**2500**	5.3	--	Check tension/condition of V-belt(s)
"	**5000**	--	5	**On SF Full-feature,** have ball valve mechanism of moisture trap inspected
"	**5000**	5.3	--	Replace V-belt(s)
--	**7500**	--	5	**On 10-bar units**, clean fan (FN1) and duct. Clean compressor element fins, have seals replaced
--	**10000**	--	5	**On 8-bar units**, clean fan (FN1) and duct. Clean compressor element fins, have seals replaced
2-yearly	**7500**	--	5	**On 10-bar units**, have bearings greased
"	**10000**	--	5	**On 8-bar units**, have bearings greased

1) **Use only authorized parts. Any damage or malfunction by the use of unauthorized parts is not covered by Warranty or Product Liability.**
2) **Whichever interval comes first.** The local Sales company may overrule the maintenance schedule, especially the service intervals, depending on the environmental and working conditions of the compressor.

Notes:

1. If the pressure drop reaches 0.5 bar, it is strongly recommended to change the filter element as its efficiency is decreasing.
2. Check more frequently if operating in a dusty atmosphere. Check for cleanness and damage. Replace a dirty or damaged filter by a new one.
3. Operate the valve by unscrewing its knurled cap one or two turns. Retighten the cap.
4. Also check the air cooler pipe. If necessary, remove dirt from the finned surface of the pipe by air jet.
5. Consult Atlas Copco.

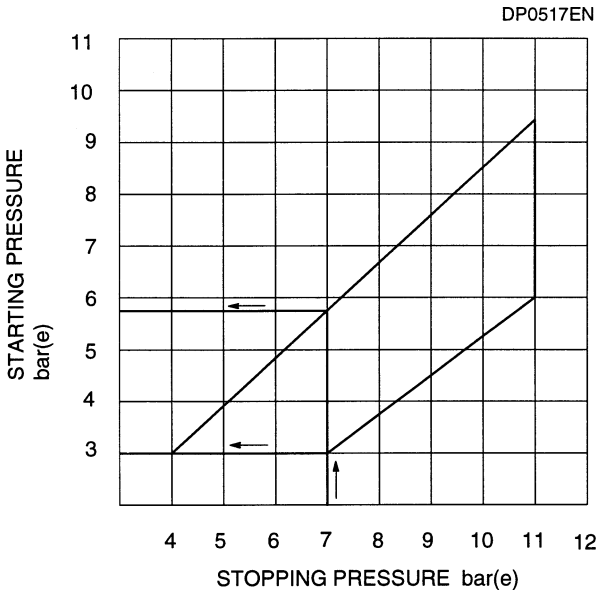
5 ADJUSTMENTS AND SERVICING PROCEDURES

5.1 Air pressure switch (Fig. 16)

The switch allows the operator to select the stopping pressure and the pressure difference between stopping and starting pressures. The stopping and starting pressures are the opening and closing pressures of the switch. **Adjustment may only be carried out when the air pressure switch is pressurized.**

The stopping pressure is controlled by adjusting screw (2). Turn the screw clockwise to raise the stopping pressure, anti-clockwise to lower it.

The pressure difference between starting and stopping is adjusted by means of adjusting screw (1). The adjustment range is given in Fig. 17. Turn the screw anti-clockwise to reduce the pressure difference, clockwise to increase it.



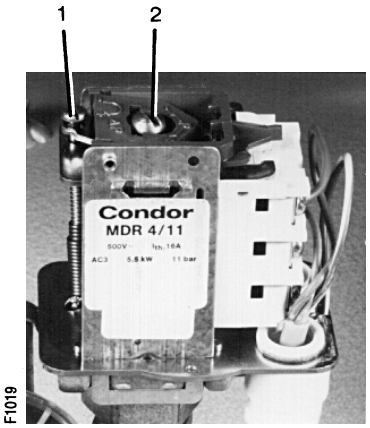
Example:
- stopping pressure : 7 bar(e)
- starting pressure : adjustable between 5.8 bar(e) and 3 bar(e)

Consult sections 7.5 up to 7.8 for the maximum pressure

Fig. 17. Adjustment range, difference between starting and stopping pressures

5.2 Air filter (AF-Figs. 2 and 3)

1. Stop the compressor. Unscrew the wing nut. Remove the filter cover and the filter.
2. Clean the cover, if necessary. Discard damaged filters.
3. Fit a new filter and reinstall the cover.



1. Adjusting screw, pressure difference
2. Adjusting screw, stopping pressure

Fig. 16. Air pressure switch

5.3 Belt exchange/tensioning

In case of two belts, the belts must be replaced as a set, even if only one of them seems worn. Use Atlas Copco belts only. The part number of the belt set is mentioned in the Parts list.

On SF Standard/Skid/Twin (Fig. 4)
1. Loosen motor hold-down bolts (3).
2. Loosen the belt tension by screwing bolts (4) equally and take out the belts.
3. Install new belts in the grooves of the pulleys.
4. Tension the belts by screwing bolts (4) equally. The tension is correct if the deflection is between 5 mm (0.20 in) and 7 mm (0.28 in) when exerting a force of 10 N (2.2 lbf) on the belt midway between the pulleys. Make sure that the pulleys remain aligned. The maximum out-of-line is:
   - maximum parallel out-of-line: 0.5 mm
   - maximum angular out-of-line: 0.5°
5. Tighten bolts (3).
6. Check the belt tension after the first 500 running hours.

On SF Pack and Full-feature (Figs. 3a and 5)
1. Remove the belt protection.
2. Loosen lock nut (3). Loosen the belt tension by screwing bolt (2) and take out the belt(s).
3. Install new belts in the grooves of the pulleys.
4. Tension the belts by screwing bolt (2). The tension is correct if the deflection is between 5 mm (0.20 in) and 7 mm (0.28 in) when exerting a force of 10 N (2.2 lbf) on the belt midway between the pulleys.
5. Tighten lock nut (3). Reinstall the belt protection.
6. Check the belt tension after the first 500 running hours.

5.4 Cooler (Ca-Figs. 2, 3a and 5)

Keep the cooler clean to maintain cooling efficiency. If necessary, remove the dirt from the finned surface of the cooler pipe by air jet.

5.5 Safety valve (SV-Figs. 2a and 15)

Operating
Operate the safety valve by unscrewing the knurled cap one or two turns. Retighten the cap.

Testing

Note: Testing the valve on the compressor must take no longer than necessary as it means an overload on compressor and drive motor.

1. Close the air outlet valve (AV-Figs. 2 or 5). Depressurize and disconnect the pipe or hose from the outlet valve.
2. Start the compressor and wait until it stops automatically.
3. Switch off the voltage. Remove the cover from the air pressure switch (PSR19-Fig. 3a or 5) or switch (S2-Figs. 2).
4. Turn screw (2-Fig. 16) one turn clockwise. Reinstall the cover.
5. Switch on the voltage, slightly open the outlet valve. The compressor will start automatically.
6. Gradually close the outlet valve while observing gauge (Gp-Figs. 2 or 3). If the safety valve does not open at the pressure specified in section 7.2 or opens before that pressure is reached, it must be replaced. If the compressor stops before the specified opening pressure is reached, repeat the procedure as mentioned from step 3.
7. Readjust the stopping pressure as described in section 5.1.
8. Reconnect the air pipe or hose to the closed air outlet valve.

Warning: *No adjustments of the safety valve are allowed.*

5.6 Temperature shut-down switch

The switch (TSHH11-Figs. 4 and 5) shuts down the compressor in case of overheating. **On SF Standard/Skid/Twin**, circuit breaker (S1-Fig. 15) will cut out and must be reset by pushing the "On" button (2-Fig. 15).

6 PROBLEM SOLVING

The table helps to solve mechanical problems.

Before starting any repair or maintenance:
1. Switch off the voltage and safeguard against unintentional "switch-on".
2. Isolate the compressor by closing outlet valve (AV-Figs. 2 and 5).
3. For compressors with a separate voltage supply to the air dryer (see section 2.4), make sure that the voltage to the dryer is also switched off.
4. Depressurize the system. **On SF Full-feature,** open drain valve (Dm1-Fig. 5).

Mechanical faults and remedies

1. Compressor does not start
- a. Switch (Q1 or S2) malfunctioning or loose connection
- a. Have electrical connections checked. Test switch. Replace if necessary
- b. Thermal overload of switch (Q1) tripped
- b. Start again after cooling off
- c. Switch (TSHH11), circuit breaker (S1) or overload relay (F21) tripped or out of order
- c. Test. Reset (S1) or (F21), if necessary. See section 5.6.
- d. Receiver pressure too high, contacts of switch (PSR19 or S2) are open
- d. Compressor will start when contacts of switch close
- e. Switch (PSR19 or S2) out of order
- e. Test switch. Replace if necessary

2. Compressor does not stop and/or safety valve blows
- a. Air pressure switch (PSR19 or S2) opens too late or not at all
- a. Readjust or test switch. Replace, if necessary
- b. Safety valve (SV) opens too soon
- b. Have valve replaced

3. Pressure difference between stopping and starting cannot be adjusted
- a. Air pressure switch (PSR19 or S2) out of order
- a. See 1e

4. Compressor capacity or pressure below normal
- a. Air consumption exceeds capacity of compressor
- a. Check equipment connected
- b. Choked air filter (AF)
- b. Remove and check filter. Replace if necessary
- c. Safety valve (SV) leaking
- c. Replace valve
- d. Drive belt(s) slipping
- d. Check condition of belt(s). Correct or replace as required
- e. Compressor element (E) out of order
- e. Consult Atlas Copco

5. Compressor overheating and/or shut down by air temperature switch (TSHH11)

a. Insufficient compressor cooling
a. Improve ventilation of compressor room. See section 2. Reset circuit breaker (S1), if necessary. See section 5.6
b. Cooling fans (FN1 and FN2) out of order
b. Check and correct. Reset circuit breaker (S1), if necessary. See section 5.6
c. Temperature shut-down switch (TSHH11) out of order
c. Replace switch

On SF Full-feature also:

6. Pressure dewpoint too high

a. Shortage of refrigerant
a. Have circuit repaired or recharged
b. Refrigerant compressor (M1) does not run
b. See 8
c. Evaporator pressure is too high
c. See 9
d. Condenser pressure is too high
d. See 7

7. Condenser pressure too high or too low

a. Fan control switch (S3) out of order
a. Have switch replaced
b. Condenser fan motor (M2) out of order
b. Have fan motor inspected
c. Ambient temperature too high
c. Improve ventilation. See section 2. If necessary, draw the cooling air from a cooler room
d. Condenser externally clogged
d. Clean condenser

8. Motor of refrigerant compressor stops or does not start

a. The internal thermic protection (S6) of the motor has tripped
a. The compressor will restart when the motor windings have cooled down

9. Evaporator pressure is too high or too low

a. Condenser pressure too high or too low
a. See 7
b. Shortage of refrigerant
b. See 6a

7 PRINCIPAL DATA

7.1 Readings on gauge (Figs. 2 and 3)

Ref.: Gp - Working pressure
Reading: Depending on setting of air pressure switch (PSR19 or S2)
Remarks: Modulates, depending on air consumption, between stopping and starting pressures

7.2 Settings of temperature switch and safety valve

Temperature shut-down switch	**Breaks at**	**Unit**	**Ref.**
Compressor element air outlet temperature	70	°C	TSHH11
Safety valve	**Opening pressure**	**Unit**	**Ref.**
Safety valve	10.5	bar(e)	SV

7.3 Cable size and settings of motor overload relay and fuse

7.3.1 For SF Standard/Skid/Twin

Compressor type	Voltage (V)	Circuit breaker (S1) (A)	Fuse **1)** (A)	Recommended mains cable size (mm^2) **2)**
SF1	230	12	16	2.5
SF2	230	9	16	2.5
SF2	400	5	16	2.5
SF4	230	15	25	2.5
SF4	400	9	16	2.5
SF6T **3)**	230	9/15	16/25	2.5
SF6T **3)**	400	5/9	16/16	2.5
SF8T **4)**	230	15	25	2.5
SF8T **4)**	400	9	16	2.5

7.3.2 For SF Pack and Full-feature - 50 Hz

Compressor type	Voltage (V)	Circuit breaker (S1) (A)	Fuse **1)** (A)	Recommended mains cable size (mm^2) **2)**
SF1	230 single-phase	11	16	2.5
SF2	200	10	16	2.5
SF2	230	5	16	2.5
SF2	400	5	8	2.5
SF2	500	4	8	2.5
SF4	200	18	20	2.5
SF4	230	9	20	2.5
SF4	400	9	16	2.5
SF4	500	7	10	2.5

1) The indicated fuse value is the maximum value with regard to the short circuit protection of the starter. The cable size used may impose fuses of a lower value.
2) **SF Twin** have a circuit breaker for each compressor module; provide for each circuit breaker separate supply cables.
3) The value before and after the slash refers to the SF2 and SF4 compressor module respectively (see data plate on the module)
4) For each compressor module

7.3.3 For SF Pack and Full-feature - 60 Hz

Compressor type	Voltage (V)	Overload relay (F21) (A)	Fuse **1)** IEC (A)	Fuse **1)** CSA/UL (A)	Recommended mains cable size (mm^2)
SF1	230 single-phase	11		15	2.5
SF2	230 single-phase	14		20	2.5
SF2	200	10	16		2.5
SF2	220	9	16		2.5
SF2	230	9	16		2.5
SF2	230	9		15	2.5
SF2	460	5	8		2.5
SF2	460	4		8	2.5
SF2	575	4		8	2.5
SF4	200	16	20		2.5
SF4	220	15	20		2.5
SF4	230	14	16		2.5
SF4	230	14		20	2.5
SF4	460	8	16		2.5
SF4	460	7		10	2.5
SF4	575	6		10	2.5

Extension cables
The size of extension cables (not on cable reel) should be in mm^2:

Cable length (m)	**Size**
0 - 25	2.5
25 - 75	4
75 - 100	6

7.4 Reference conditions/limitations

Reference conditions:
- Air inlet pressure (absolute) . . . . . 1 bar
- Air inlet temperature . . . . . 20°C
- Relative air humidity 0%
- Nominal working pressure . . . . . See values below

Limitations
- Max. working pressure . . . . . See values below
- Max. ambient temperature . . . . . 40°C
- Min. ambient temperature . . . . . 0°C

1) The indicated fuse value is the maximum value with regard to the short circuit protection of the starter. The cable size used may impose fuses of a lower value.

7.5 SF1-2-4 Standard/Skid - 50 Hz 1)

Compressor type		SF1 8 bar	SF2 8 bar	SF4 8 bar	SF2 10 bar	SF4 10 bar
Maximum working pressure	bar(e)	8	8	8	10	10
Nominal working pressure	bar(e)	7	7	7	10	10
Air temperature at outlet valve for SF Skid, approx.	°C	38	45	65	40	60
Air temperature at outlet valve for SF Standard, approx.	°C	30	32	40	28	40
Motor shaft speed	r/min	1430	1430	1430	1430	1430
Shaft input	kW	1.5	2.0	3.15	2.1	3.0
Sound pressure level	dB(A)	65	69	70	65	65

7.6 SF1-2-4 Pack/Full-feature - 50 Hz 1)

Compressor type		SF1 8 bar	SF2 8 bar	SF4 8 bar	SF2 10 bar	SF4 10 bar
Maximum working pressure for SF Pack	bar(e)	8	8	8	10	10
Maximum working pressure for SF Full-feature	bar(e)	7.75	7.75	7.75	9.75	9.75
Nominal working pressure **2)**	bar(e)	7	7	7	10	10
Air temperature at outlet valve for SF Pack, approx.	°C	35	40	40	35	35
Air temperature at outlet valve for SF Full-feature, approx.	°C	25	27	27	25	25
Motor shaft speed	r/min	1410	1430	1430	1430	1430
Shaft input	kW	1.5	2.1	3.5	2.1	3.0
Sound pressure level	dB(A)	54	58	59	54	54
For SF Full-feature also:						
Refrigerant type		R134a	R134a	R134a	R134a	R134a
Pressure dewpoint, approx	°C	2	3	3	2	2

7.7 SF2-4 Pack/Full-feature - 60 Hz 1)

Compressor type		SF1 100 psi	SF2 100 psi	SF4 100 psi	SF2 125 psi	SF4 125 psi
Maximum working pressure for SF Pack	bar(e)	8	8	8	9.1	9.1
Maximum working pressure for SF Full-feature	bar(e)	7.75	7.75	7.75	8.85	8.85
Nominal working pressure	bar(e)	7	7	7	8.6	8.6
Air temperature at outlet valve for SF Pack, approx.	°C	35	40	40	35	35
Air temperature at outlet valve for SF Full-feature, approx.	°C	25	27	27	25	25
Motor shaft speed **3)**	r/min	1720	1710	1720	1710	1720
Shaft input for SF Pack	kW	1.5	1.95	3.1	2.0	2.9
Shaft input for SF Full-feature	kW	1.55	2.0	3.15	2.05	2.95
Sound pressure level	dB(A)	54	58	59	54	54
For SF Full-feature also:						
Refrigerant type		R134a	R134a	R134a	R134a	R134a
Pressure dewpoint, approx. **4)**	°C	2	4	4	2	2

1) At reference conditions
2) 9.75 bar(e) for Full-feature 10 bar compressor
3) 1710 r/min for SF2 single-phase
4) At 20°C / 100% relative humidity

7.8 SF6T-8T Twin - 50 Hz 1)

Compressor type		SF6T 8 bar	SF8T 8 bar	SF6T 10 bar	SF8T 10 bar
Maximum working pressure	bar(e)	8	8	10	10
Nominal working pressure	bar(e)	7	7	10	10
Air temperature at outlet valve, approx.	°C	40	40	40	36
Motor shaft speed	r/min	1430	1430	1430	1430
Shaft input	kW	5.15	6.3	5.1	6.0
Sound pressure level, 250 l vessel	dB(A)	72	72	65	65
Sound pressure level, 475 l vessel	dB(A)	73	73	66	66

7.9 Conversion list of SI units into US/British units

1 bar = 14.504 psi
1 g = 0.0353 oz
1 kg = 2.205 lb
1 km/h = 0.621 mile/h
1 kW = 1.341 hp (UK and US)
1 l = 0.264 US gal
1 l = 0.220 Imp (UK gal)
1 l = 0.0353 cu.ft
1 m = 3.281 ft
1 mm = 0.0394 in
1 m^3/min = 35.315 cfm
1 mbar = 0.401 in water column
1 N = 0.225 lbf
1 Nm = 0.738 lbf.ft
X °C = (1.8X + 32) °F **2)**

1) At reference conditions
2) A temperature difference of 1°C = a temperature difference of 1.8°F

Notes:

Notes: